

DOCUMENT RESUME

ED 141 746

CS 003 401

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 TITLE A Study of Reading Disability in the United States.
 Final Report.
 INSTITUTION Oregon Univ., Portland. Medical School.
 SPONS AGENCY National Inst. of Education (DHEW), Washington,
 D.C.
 BUREAU NO BR-472115
 PUB DATE Nov 75
 GRANT 32-47-8210-6017
 NOTE 310p.; Some tables may be marginally legible due to
 print quality of the original document; This study
 was prepared by the Health Sciences-Center, School of
 Medicine, Oregon University

EDRS PRICE MF-\$0.83 HC-\$16.73 Plus Postage.
 DESCRIPTORS Academic Achievement; Elementary Education;
 *Environmental Influences; *Family Environment;
 Longitudinal Studies; *Neurological Defects; *Reading
 Achievement; *Reading Difficulty; *Reading
 Research

ABSTRACT

This volume reports on a longitudinal study of reading achievement in a group of children, undertaken to clarify nonneurological bases for reading disability. While other measures of scholastic achievement were obtained, the primary focus was upon reading. Specifically, goals were defined to determine the earliest time at which the long-term pattern of reading achievement can be ascertained, to determine whether neuropsychological testing preceding entrance into kindergarten (or first grade) will define these patterns, and to determine the influence of the child's family origin and background on reading and on other forms of scholastic achievement. Data were collected from a cohort of children drawn from a segment of the National Collaborative Perinatal Study and from subjects of the Oregon Collaborative Study; the data traced subjects academic performance from the first grade through the sixth grade and assessed demographic, familial, and prenatal factors. The two sections of the volume are devoted to biological and neuropsychological data and to socioeconomic and home-environment data. Appendixes describe a collaborative study and provide the vitae of the present study's authors. (KS)

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Project No. 472115
Grant No. 32-47-8210-6017

A STUDY OF READING DISABILITY
IN THE UNITED STATES

Final Report

John B. Isom
Project Director

BEST COPY AVAILABLE

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School of Medicine
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Portland, Oregon

November, 1975

The material presented herein, its analysis, and conclusions drawn therefrom were pursuant to a grant initially from the Bureau of Education for the Handicapped, U.S. Office of Education, later from the National Institute of Education, Department of Health, Education, and Welfare. The points of view, opinions or conclusions expressed herein do not necessarily reflect the position or policy of H.E.W., nor should any official endorsement be inferred.

Department of Health, Education, and Welfare
National Institute of Education

CS 003401

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PREFACE

Experience has indicated that one unfamiliar with this study has difficulty conceptualizing the relationships of component groups of children, primary goals of the study, schedule of testing, and professional discipline of the personnel involved.

A brief overview of these considerations is presented herein. More detailed discussion of these topics occurs in the text of the report.

The raison d'etre for this study is elaborated in the section entitled BACKGROUND. Stated as broadly and succinctly as feasible, the goals of this study were: 1.) to determine the earliest time at which the long term pattern of reading achievement, in particular, and scholastic achievement, in general, can be ascertained (achievement scores, criteria variables, were obtained in May, at the end of grades one through six;) 2.) to determine whether parameters derived from neuropsychological testing immediately preceding entrance into kindergarten and/or first grade will define or predict these patterns; 3.) to determine the influence of the child's family on reading (scholastic) achievement.

The cohort chosen for this study, the Reading Study (R.S.) was a subset of a larger group, the Child Development Study (C.D.S.). Both groups are described in detail in later sections.

Suffice it to say, at this point, the children were enrolled onto the C.D.S. throughout a calendar year, each year, for several consecutive years.

The R.S. was funded by the U.S. Office of Education as of February, 1966. Children enrolled onto the C.D.S. during its first complete calendar-year of operation would have been eligible, on the basis of age, for admission to the first grade in September, 1966. These children were examined in the summer of 1966, prior to their entering the first grade. A pre-kindergarten exam was necessarily precluded. All children subsequently enrolled onto the R.S. were to be examined, whenever possible, in the summers preceding eligibility for entering kindergarten and first grade.

It was originally intended that pre-school children would be examined each summer in the years 1966 through 1971. The time, effort, and expense involved in the summer-time exams was considerable and increased each year. This fact, and the conclusion reached by 1970, that the characteristics of the sample changed little from year-to-year, prompted termination of the pre-school exams as of 1970.

The administrative supervision of this project was transferred to the National Institute of Education (NIE) in 1972. We were notified in December, 1972 that the funding of this study would be terminated as of June, 1973. This decision

was reconsidered, and termination was then set for December, 1973. This was post-poned until April 30, 1974, at which time financial support for the study did end.

This schedule of termination is responsible for the fact that only one of the groups of children enrolled onto the study was examined in both pre-school periods and from whom achievement scores for all six grades are available. The period of extension, June-December, 1973, permitted collection and processing of the achievement data for the school year 1972-1973. The extension to April, 1974 permitted some analyses of that data.

The various distinct groups of children referred to in the text of this report have been a source of confusion to those unfamiliar with this study. Although the impetus for this study derived from observations made upon a group of children doing poorly in school, ostensibly because of primary deficiency in reading, reading problems, per se, were not the focus of this study. The focus of this study was upon the detection and delineation of different patterns of reading achievement. The primary goal of the study was the earliest possible detection of these patterns.

The information derived from this study may, and possibly will, be used to provide insight into reading problems and development of strategies of intervention vis-a-vis the poor reader. This is, however, a consideration separate and distinct from the stated goals of the project, and one not covered in this report.

One final comment, relating to data acquisition and processing is in order, and this the most appropriate place. The pre-school exams were accomplished by the same cadre, less than a dozen in number, of senior, experienced examiners, over the years. This spoke for maximally feasible accuracy and completeness. The achievement tests were administered, whenever possible, by the child's teacher. The result of this was that a large number of teachers, in many schools, in several school districts, executed the test instruments. There was, expectedly, great variability in the completeness and accuracy of administering and grading the tests.

When the testing could not be accomplished by the child's teacher, a member of the project-staff executed the test, if feasible. This was done in May-June of the school year, preferably. Examination was attempted, again, no later than the following October 15, if not accomplished earlier.

Once the data were in hand, it was checked for accuracy, recorded on code sheets, transferred to computer-cards (key-punched), entered into the computer data bank, then carefully

and extensively edited. Updating of the computer data was an ongoing process.

The upshot of this is that an impressive amount of time and effort was expended in securing a "clean" data base. The pre-school exam and school achievement test data represent several hundred items of information collected on each child. Information obtained directly by this project was gathered over a maximal period of eight years (pre-kindergarten through grade six.) An additional, roughly equal, amount of information on each child was obtained from the data base already developed by C.D.S.

The maximal number of items of information obtained by this study per child, directly and indirectly, is 434. We consider it would be difficult to improve upon the quality (in the vernacular of the computer world) of this data.

A major thrust of this study has been an attempt to determine the nature and extent of the influence of the child's family upon his scholastic performance. To that end, Katherine French, Ph.D., an anthropologist, played a major role. She developed, expressly for this study, the interview instrument (FILE) employed in interviewing the child's mother. (She also developed the Family Health History, a major interviewing instrument utilized in the C.S.D.) Dr. French supervised the administration of the FILE, developed the scoring and coding of the FILE, and performed the analysis and inter-

pretation of the data obtained from the FILE. This phase of the study is a self-contained unit and is presented as a separate section, in PART II in the body of the text.

INTRODUCTION

This is a report on a prospective, longitudinal study of reading achievement in a group of children unselected with respect to reading skills. Other measures of scholastic achievement were obtained, but the principal emphasis was upon reading achievement.

There were three primary and three secondary objectives of this study. The primary objectives were:

1.) Determining whether administration of an array of tests, regarded as neuropsychological in character, in the pre-kindergarten and pre-first grade period permits prediction of reading achievement.

2.) Determining whether the influence of socioeconomic status, family constellation, parental attitudes toward learning and child-teaching practices on reading achievement, in particular, and scholastic achievement, in general, could be defined and quantified.

3.) Determining whether there is a significant difference in the May reading achievement score of 6th grade children initially reading at grade level in the 1st, 2nd, or 3rd grade.

This is an attempt to answer one element of a larger set of questions: do children reading well in early grades continue to do so? Do some children reading poorly early on

subsequently improve their reading achievement? If so, at what age, or grade placement level?

Another question of interest, operationally related to those above, presumptively may be answered employing the same data base. Are different patterns of reading achievement, over an extended period of time (years) found in children in numbers sufficiently large to be useful in terms of devising pedagogic strategies for the various groups? In the later part of this study, the more circumscribed inquiry, i.e., looking for the pattern of children reading adequately in grades one, two and three, and adequately or not in the sixth grade, was expanded into searching for the presence of several different patterns of reading achievement.

The secondary, or corollary, objectives were:

- 1.) Determining the presence or absence of neurological abnormalities in children with deficient reading achievement.

- 2.) Determining whether specific factors in pregnancy, delivery or neonatal period; speech evaluation at three years of age; psychological testing at four and seven years; and neurological evaluation at seven years of age, correlate with reading achievement.

The functional goals of the study were as follows:

1. Administration of neuropsychological tests (predictors) to the cohort in the summer immediately preceding eligibility for entrance into kindergarten and/or first grade.

2.) Administration of a previously constructed standardized formal interviewing instrument. The mother was the person interviewed. This was accomplished, as much as possible, in the summer. The remaining interviews were accomplished throughout the year, as necessary.

The data obtained with this instrument were used to define socioeconomic status, describe family constellation, indicate parental attitudes, etc.

3.) Administration of standard achievement tests, in May of each school year, to determine reading achievement, particularly, in grades one through six, and spelling ability and arithmetic computation skills in grades three through six.

Other data to be employed in attempting the objectives of the study were obtained from an ongoing study of a larger number of children of which this cohort was a part. The ongoing study, the Collaborative Perinatal Study, was known locally as the Child Development Study (C.D.S.) and is described in detail in Appendix A. The Collaborative Perinatal Study was national in scope, involving twelve different centers. More detailed information on the national study, including background history, composition of study population, etc. is contained in The Women and Their Pregnancies, the U.S. Department of Health, Education and Welfare, P.H.S., N.I.H., Philadelphia, W.B. Saunders Co., 1972.

The project director of the study described herein, the Reading Study, is a pediatric neurologist, and the neurological consultant to the Child Development Study, both studies centered at the University of Oregon Medical School, located in Portland, Oregon. This accounts for the predominantly medical orientation of this study, particularly PART I.

A few comments should be made regarding the different numbers of children in two or more subsets of the sample which, ostensibly, should be identical, but are not. These special differences arise from three different sources.

The timing of data collection follows either of two different schedules. One is based upon the child's date of birth or chronological age or birthdate. The other is dependent upon the child's grade placement. A second source of variation is that a given batch of data can be retrieved from the computer file by different algorithms. The third variable reflects the mobility of the families of the children comprising the cohort.

Re timing of data collection: The data collected by the C.D.S., all data included herein excluding pre-school tests and school achievement test, was collected according to the schedule base on chronological age. All R.S. data was collected with respect to grade placement. Thus, most, but not all, children born in, say, 1962, entered the first grade in 1968, but some children entering the first grade in 1968 were born

in 1961. As a consequence, the number of children born in 1962 does not equal the number of children entering first grade in 1968. A further complication stems from the fact that a few children, for various reasons, entered first grade, or kindergarten, a year earlier or later than most age-peers. If a child repeated a grade, the achievement scores for the repeated grade are excluded but subsequent, non-repeated, grade scores are included. Re different algorithms: Comparison of predictor and criterion variables obviously requires valid scores for both parameters. Thus, if one uses, say, second grade achievement scores as criteria, and pre-kindergarten and pre-first grade predictors, the numbers involved will differ, because not all children tested in pre-kindergarten were tested in first grade, and vice-versa.

The families of this cohort moved about a great deal. They changed addresses within a school district, moved from one school district to another within Oregon, or moved from Oregon to other states. The reverse process also obtained. The net result is that, each year, a fraction of children are "lost to follow-up," only to reappear at a later testing date. Once a given child was enrolled onto the R.S., testing was accomplished whenever feasible. This mobility was more apparent in the earlier than the later grades.

Another kind of "mobility" also influenced numbers in a given category over time. A significant percentage of this

cohort was born to unmarried women. Subsequent marriage by the mother resulted in the child's name changing. This sometimes resulted in temporary or permanent loss of the child to this study. Another source of loss was adoption. It was most unusual for adopting families to permit the child to continue on the study.

Several terms, numbers and abbreviations are used recurrently in this report and are presented here for the reader's convenience:

WM - white male	C.D.S. - Child Development Study
WF - white female	R.S. - Reading Study
BM - black male	S.E.S. - Socioeconomic Score
BF - black female	S.E. - Socioeconomic

SAT - Stanford Achievement Test

Subtests PM - paragraph meaning

Arith - arithmetic

Sp - spelling

WISC - Wechsler Intelligence Scale for Children

Gr. - Grade placement at time of observation

Gr. Score - A two digit decimal number, indicating grade equivalent on a S.A.T. subtest; the number to the left of the decimal indicates year, to the right, month of the year. Thus, 1.4 means achievement equivalent of that expected by the fourth months of the first grade.

N, N_1, N_2, n , etc. - number of observations or individuals in a particular category.

X, X_1, X_2 , etc. - value of a parameter.

$\bar{M}, \bar{X}, \bar{X}_1, \bar{X}_2$, etc. - mean value of a series of scores on a particular test or of some observation.

Color Code: represents the year a given group of children were eligible, on the basis of age, for entrance into first grade.

green - 1966

yellow - 1967

pink - 1968

blue - 1969

buff - 1970

Var. no. - variable number; refers to coding number by which various data are assigned to the computer file.

Number and item of data indicated where used. Useful when an array of data is displayed.

BACKGROUND

The impetus for this study derived from observations made upon about two hundred children in the period 1963 to 1965. These children were evaluated at the University of Oregon Medical School (UOMS) because of deficient reading achievement for inapparent reasons. They had, at least, average, normal intelligence, had no visual or auditory impairment, and did not reflect obvious personal or family psychopathology. History of birth was not remarkable, nor was acquisition of developmental milestones, including age of onset and quality of speech. The parent(s), usually the mother, the child's medical historian, had no suspicion that difficulty in learning to read was in the offing. Examination failed to reveal any distinctive neurological abnormalities. No particular prevalence of left-handed or left-eyed children was noted, no particular combination of monomaneal hand - monocular preference emerged. In short, other than an inability to read properly, and perform tasks reflecting effective short-term memory (digit span retention) and "sequencing" ability (naming days of week, months of year, reciting alphabet, etc.), no unusual features were noted in the children. One feature of the family make-up did appear to stand out: the male parent was never present in the home - unmarried or divorced mothers, or he was absent frequently for long periods by virtue of occupation - logger, merchant seaman, fisherman, truck driver,

etc. In summary, the children did not read well, no reason for this was immediately apparent, and there was a suspicion that some element of the child's family was notably different and perhaps etiologically implicated. Further discussion of this group of children can be found in Isom, 1968 and 1969.

Most of the children were, by election, in third and fourth grades, or higher. A universal comment was that the children had been doing poorly, virtually, since the first day that they entered school. They were poor readers, did poorly, but relatively better in arithmetic (many were spuriously regarded as doing well in arithmetic) and were generally regarded as grossly deficient in spelling ability.

They were not behavior problems, in the sense of being disorderly or unmanageable, but, by age ten or eleven, had obvious feelings of inferiority. They had been subject to a variety of remedial measures, to no avail. It could not be determined whether their attitude and deficiencies reflected a primary problem present before entering school or the effect of repeated failure over years.

The attempted resolution of this question obviously called for a longitudinal study, extended over years, acquiring information about the child's family, capacities in several areas, and achievement in different fields. Information regarding birth and neurological development would be very desirable. A sample of many children would be required. An exact number would be difficult to ascertain, just a large sample.

This writer has had considerable experience with and is aware of the enormous obstacles inherently present in the path of a longitudinal study extending over years and involving a sample of the requisite number.

Fortuitously, a segment of the National Collaborative Perinatal Study (see Appendix 1) was then extant at the UOMS. This study was acquiring data, in prospective fashion, on a cohort of children born at the UOMS hospital. Detailed information regarding pregnancy, labor, delivery, developmental milestones, neurological status, I.Q., speech, family structure, socioeconomic status, and a host of other variables was already available on a group of children. Additional children would be added to the study in the immediately ensuing years. Most importantly, an elaborate mechanism for long-term follow-up of this group was already operative. We could avail ourselves of this pool of children, and the follow-up process, at virtually no cost.

The information collected on this group by 1965 suggested that they represented a suitable group for study. The study was designed to get at some of the considerations alluded to in this section, and more precisely stated in the preceding sections of this report. A proposal reflecting these considerations was submitted to the U.S. Office of Education in 1965, and the study was funded beginning February 1, 1966.

INSTRUMENTATION

The data obtained by the C.D.S. were recorded on multi-carbon, pre-coded forms developed for that study. The data collected is listed in Appendix 1.

The data obtained from the interview with the mother in the pre-school period (FILE) was recorded on similar multi-carbon, pre-coded forms. A copy of FILE is attached hereto.

The following tests were administered to children on the R.S. in the summer preceding entrance into kindergarten and/or first grade.

1. The Illinois Test of Psycholinguistic Abilities (ITPA).
2. The Metropolitan Readiness Test.

Both of these tests were administered and scored according to directions in manuals supplied by the publisher of the tests.

3. The Bender-Gestalt Test, scored according to Koppitz.
4. Piaget's test of development of concept of right and left.

5. A laterality preference test to determine a.) which hand the child preferred for using a fork, throwing a ball and using a pencil. If all three tasks performed by same hand, the child was right- or left-handed. If both hands were used, child was said to have mixed handedness. b.) which eye used to look through a kaleidoscope. This determined whether the child was right or left eyed. c.) if hand and eye preference on

same side, child said to have consistent hand-eye preference and if neither of these, child said to have crossed or mixed preference.

6. A miscellaneous test to determine whether child can write his name and a count of letters of alphabet which can be written correctly, graphically and in order. A similar count was made of the numbers from 1 to 20 written correctly and in order.

7. Stanford Achievement Tests were administered, graded, and scored according to the publisher's manual. These tests were administered in May, for the most part, and in June, in some cases. The few children missed at end of school year, and still in the area, were tested early in the following school year.

8. A School Behavior Rating Profile was completed, by the teacher, on each child, each year (Balow).

9. A Cumulative Record Review was also obtained, by our own personnel, each year on each child. The principal use of this form was determining the special services, if any, afforded a given child.

SAMPLING PROCEDURES AND DATA ACQUISITION

The practical utility of the results of a given test instrument or an item of medical history is a function of the feasibility of test administration or the general availability of the medical history. Further, the data must be reasonably available from a variety of subsets of the grade-school population, over a period of years. The test of practical utility was applied to all the data examined by the R.S.

In keeping with this philosophy, the following data was abstracted from the records of the C.D.S. on children enrolled onto the R.S.: elements of the pregnancy, labor, delivery and immediate neonatal period, the neurological examination performed at one and seven years of age, the speech and hearing examination at three and eight years of age, and the psychological exam (I.Q. test) at four and seven years of age.

The summers immediately preceding age-eligibility for entrance into kindergarten (pre-Kg.) and first grade (pre-1st) were chosen as appropriate times for administering those instruments representing predictor variables. Achievement tests, representing criteria variables, were administered at the end of the school year (May) in grades one through six.

The files of the C.D.S. were used to locate the children in the spring at the year the child's age made him eligible for entrance into kindergarten or first grade. The family was contacted, the purpose of this study presented and their

cooperation requested. In the event that the family did not wish to participate in this study, their continuation in the C.D.S. was not jeopardized in any fashion.

In the event that a child was not located in the pre-Kg. period, an attempt was made to locate him in the pre-1st grade spring. Most children, excluding the Green group, had both a pre-Kg. and pre-1st grade exam; every child in the R.S. had at least one pre-school exam.

The decision to follow the children through the sixth grade was predicated principally upon three considerations:

- 1.) Experience with the children evaluated for reading problems taught that some of these children, all boys, apparently spontaneously improved in reading achievement between age ten and twelve years. No such improvement was noted after age twelve.
- 2.) A survey of individual faculty members of several schools of education and/or staff of educational diagnostic clinics and experienced remedial reading teachers indicated that beyond age twelve, there is little likelihood of spontaneous improvement in reading achievement.
- 3.) Normal children achieve adult performance patterns with respect to a number of developmental variables by age twelve.

Children living in the metropolitan area in which this study was based ordinarily do not enter the first grade before five years and nine months of age. Barring repeating a grade, they will ordinarily attain age twelve years in grade six. Hence, end of sixth grade was chosen as the terminal point of

observation.

A pilot study was executed in the summer of 1965. The purpose was to obtain an estimate of the number of children available for pre-school testing out of the pool of children in the C.D.S. scheduled for entrance into the first grade in the following September. It was concluded from this pilot that between 300 and 350 children would be available for pre-Kg. testing and a like number for pre-1st testing.

As can be seen from Table 1, there was variation from year to year, but the mean number examined each year was 308. The variation in the number of children enrolled onto the R.S. each year reflects similar variation in the numbers enrolled onto the C.D.S. The Green group on the R.S. corresponds to the pregnant women enrolled on the C.D.S. during its first full calendar year of operation. The geographic boundaries of the residency of the pregnant women and the method of "random selection" within this group was changed twice after the study began. The purpose was to register an appropriate and relatively constant number each year. This was achieved with the Blue group. The changing selection procedure accounts for change in N's. The year that the mothers of those children were enrolled onto the C.D.S. represents the largest annual enrollment in the six-year-intake period of the C.D.S.

There is a discrepancy between the total number of children indicated in Table 1, 1540, and the number of children on whom data is stored in the computer. There are two reasons

for this discrepancy: 1.) One of the people coding the pre-school exams obtained one summer took some material home with her one night. Her house burned completely, and some records were lost. Any child whose records were in this group and who had only one pre-school exam would be "lost". The numbers in Table 1 were taken from a log which recorded the exams as they were performed, but before the exams were graded and coded. The computer data was entered only after coding was completed. 2.) Any child whose I.Q. was less than 50 was removed from the computer file. In this community, children with I.Q.'s less than 50 do not attend regular public schools. It was felt that their experience would be inappropriate preparation for standardized achievement testing.

The schedule of data collection by the R.S. is presented in Tables 1 and 2. Table 3 is an overview indicating the total number of children taking any exam, in each grade, for the four R.S. groups. Tables 4 to 8 and 9 to 12 present the same data in two different ways. Tables 4 to 12 list only those children taking a paragraph meaning test. Thus, there may be a disparity between appropriate numbers in Table 3 and Tables 4 to 12. For example, 401 WM's were tested in first grade, although the sum of WM in grade one in Tables 4 to 8 is only 387, hence, 14 children took Word Reading and/or Vocabulary, but not Paragraph Meaning.

The next set of tables gives results of achievement testing. Table 13 presents an overview of results, with grade equivalent scores (called "grade score" in tables for brevity) and standard deviation for each achievement test, each R.S. group. Tables 14 through 22 comprise two sets of tables presenting the same data two different ways. Tables 23 to 25 indicate percentage of children achieving at or above grade level.

SPECIAL CAUTION: It is apparent, even upon casual inspection, that this group of children does not achieve well. This was unsuspected at the time of conceptualization of the study but was conjectured after the first summer of pre-school testing and confirmed at the end of the first year of achievement testing. For this reason, the test instruments were not administered according to the schedule described by the publisher of the tests. The Primary I test was administered at the end of 1st and 2nd grade, Primary II at the end of 3rd and 4th grade, and Intermediate I at the end of grades 5 and 6.

Obviously, this deviation from usual practice requires added caution in comparing these results with other studies and emphasizes the degree of underachievement of this group.

TABLE 1

YEAR INDICATED DATA OBTAINED FROM EACH GROUP

GROUP COLOR CODE	<u>PRE-SCHOOL EXAM</u>		<u>S.A.T. TESTS</u>					
	Kg.	1st	1	2	3	4	5	6
GREEN (257)*	-	'66	'67	'68	'69	'70	'71	'72
YELLOW (324)	'66	'67	'68	'69	'70	'71	'72	'73
PINK (355)	'67	'68	'69	'70	'71	'72	'73	-
BLUE (304)	'68	'69	'70	'71	'72	'73	-	-
BUFF (300)	'69	'70	'71	'72	'73	-	-	-

* Parentheses indicate number of children tested in pre-Kg. and/or pre-1st grade period.

TABLE 2

<u>GROUP COLOR CODE</u>	YEAR EACH GROUP BEGAN INDICATED GRADE							
	19-	-66	-67	-68	-69	-70	-71	-72
GREEN		1	2	3	4	5	6	-
YELLOW		Kg*	1	2	3	4	5	6
PINK			Kg	1	2	3	4	5
BLUE				Kg	1	2	3	4
BUFF					Kg	1	2	3

* Not all children in any group attended kindergarten.

TABLE 3
NUMBER OF STUDENTS TESTED BY GRADE
AND RACE-SEX CATEGORY

<u>GRADE</u>	<u>RACE-SEX CATEGORY</u>			
	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
1	401	397	231	224
2	409	400	224	227
3	373	376	215	225
4	284	297	185	179
5	182	204	123	133
6	93	120	86	81

TABLE 4
NUMBER OF CHILDREN TESTED IN
FOUR RACE-SEX GROUPS
BY
INDICATED YEAR OF ENTRY INTO FIRST GRADE
1966

<u>GRADE</u>	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
1	50	60	48	48
2	52	71	45	49
3	50	67	46	48
4	51	65	46	48
5	47	64	36	42
6	42	61	41	40

TABLE 5
NUMBER OF CHILDREN TESTED IN
FOUR RACE-SEX GROUPS
BY
INDICATED YEAR OF ENTRY INTO FIRST GRADE
1967

<u>GRADE</u>	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
1	87	71	50	48
2	85	71	51	48
3	83	70	50	44
4	80	68	48	44
5	73	64	45	44
6	51	59	45	38

TABLE 6
NUMBER OF CHILDREN TESTED IN
FOUR RACE-SEX GROUPS
BY
INDICATED YEAR OF ENTRY INTO FIRST GRADE
1968

<u>GRADE</u>	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
1	88	100	46	45
2	86	96	51	42
3	84	88	44	46
4	82	91	47	44
5	62	75	41	46
6	-	-	-	-

7

TABLE 7

NUMBER OF CHILDREN TESTED IN

FOUR RACE-SEX GROUPS

BY

INDICATED YEAR OF ENTRY INTO FIRST GRADE

1969

<u>GRADE</u>	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
1	88	80	38	37
2	85	80	39	43
3	89	81	44	46
4	73	73	44	43
5	-	-	-	-
6	-	-	-	-

TABLE 8
NUMBER OF CHILDREN TESTED IN
FOUR RACE-SEX GROUPS
BY
INDICATED YEAR OF ENTRY INTO FIRST GRADE
1970

<u>GRADE</u>	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
1	74	76	25	28
2	91	82	35	44
3	67	70	31	41
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

TABLE 9
NUMBER OF CHILDREN TESTED
BY
YEAR OF ENTRY INTO FIRST GRADE
WHITE MALES

<u>GRADE</u>	<u>YEAR OF ENTRY INTO FIRST GRADE</u>				
	<u>'66</u>	<u>'67</u>	<u>'68</u>	<u>'69</u>	<u>'70</u>
1	50	87	88	88	74
2	52	85	86	85	91
3	50	83	84	89	67
4	51	80	82	73	-
5	47	73	62	-	-
6	42	51	-	-	-

TABLE 10
NUMBER OF CHILDREN TESTED
BY
YEAR OF ENTRY INTO FIRST GRADE
WHITE FEMALES

<u>GRADE</u>	<u>YEAR OF ENTRY INTO FIRST GRADE</u>				
	<u>'66</u>	<u>'67</u>	<u>'68</u>	<u>'69</u>	<u>'70</u>
1	60	71	100	80	76
2	71	71	96	80	82
3	67	70	88	81	70
4	65	68	91	73	-
5	64	64	75	-	-
6	61	59	-	-	-

TABLE 11
NUMBER OF CHILDREN TESTED
BY
YEAR OF ENTRY INTO FIRST GRADE
BLACK MALES

<u>GRADE</u>	<u>YEAR OF ENTRY INTO FIRST GRADE</u>				
	<u>'66</u>	<u>'67</u>	<u>'68</u>	<u>'69</u>	<u>'70</u>
1	48	50	46	38	25
2	45	51	51	39	35
3	46	50	44	44	31
4	46	48	47	44	-
5	36	45	41	-	-
6	41	45	-	-	-

TABLE 12
NUMBER OF CHILDREN TESTED
BY
YEAR OF ENTRY INTO FIRST GRADE
BLACK FEMALES

<u>GRADE</u>	<u>YEAR OF ENTRY INTO FIRST GRADE</u>				
	<u>'66</u>	<u>'67</u>	<u>'68</u>	<u>'69</u>	<u>'70</u>
1	48	48	45	30	28
2	49	48	42	37	44
3	48	44	46	49	41
4	48	44	44	52	-
5	42	44	46	-	-
6	40	38	-	-	-

TABLE 13

MEAN S.A.T. SCORES AND S.D. BY RACE-SEX CATEGORY

(NUMBER CODE OF INDICATED TEST IN PARENTHESES)

<u>GRADE</u>	<u>TEST CODE</u>	<u>S.A.T.</u>	MEAN GRADE SCORE - S.D.			
			<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
ONE	(6)	WORD READING	1.4-1.1	1.5-1.1	1.4-1.0	1.4-1.1
	(7)	PARAGRAPH MEANING	1.5-1.4	1.6-1.4	1.5-1.4	1.5-1.1
	(8)	VOCABULARY	1.6-1.1	1.5-1.0	1.3-1.0	1.1-1.0
TWO	(9)	WORD READING	1.8-1.1	2.0-1.2	1.2-1.1	1.8-1.2
	(10)	PARAGRAPH MEANING	1.8-1.6	1.9-1.5	1.6-1.3	1.8-1.5
	(11)	VOCABULARY	2.3-1.1	2.3-1.1	1.8-1.1	1.2-1.1
THREE	(12)	PARAGRAPH MEANING	2.6-1.8	2.9-1.8	2.2-1.7	2.4-1.7
	(13)	SPELLING	2.8-2.4	3.1-2.4	2.5-2.4	2.9-2.4
	(14)	ARITHMETIC COMPUTATION	3.0-1.0	3.0-1.9	2.8-1.9	2.9-1.9
FOUR	(15)	PARAGRAPH MEANING	3.2-1.8	3.5-1.7	2.6-1.8	2.9-1.7
	(16)	SPELLING	3.3-2.5	3.6-2.4	3.1-2.5	3.4-2.4
	(17)	ARITHMETIC	3.7-2.0	3.9-2.0	3.4-2.3	3.5-2.1
FIVE	(18)	PARAGRAPH MEANING	4.4-2.5	4.4-2.3	3.2-2.2	3.8-2.3
	(19)	SPELLING	4.0-3.0	4.5-2.9	3.7-2.6	4.2-3.0
	(20)	ARITHMETIC	4.3-3.1	4.4-3.1	2.7-1.6	4.0-3.1
SIX	(21)	PARAGRAPH MEANING	5.0-2.6	5.5-2.4	4.0-2.3	4.4-2.4
	(22)	SPELLING	4.3-3.1	4.9-2.8	4.2-2.9	4.8-2.9
	(23)	ARITHMETIC	4.6-3.3	5.0-3.1	4.1-3.1	4.4-2.9

TABLE 14
 $\bar{M}$ P. M. and ARITH. SCORES
 OF FOUR RACE-SEX GROUPS
 BY
 YEAR OF ENTRY INTO FIRST GRADE
1966

	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
<u>S.A.T. $\bar{M}$ GRADE SCORE</u>				
PARAGRAPH MEANING				
GRADE:				
1	1.5	1.5	1.4	1.5
2	1.8	2.0	1.7	1.9
3	2.5	2.9	2.2	1.7
4	3.1	3.6	2.6	3.1
5	4.1	4.9	3.7	4.1
6	4.6	5.5	3.9	4.6

ARITHMETIC

GRADE:				
3	2.9	3.0	2.8	2.9
4	3.8	3.9	3.6	3.7
5	4.1	4.6	3.9	4.4
6	4.5	5.0	4.1	4.4

TABLE 15
 M P. M. and ARITH. SCORES
 OF FOUR RACE-SEX GROUPS
 BY
 YEAR OF ENTRY INTO FIRST GRADE
1967

	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
<u>S.A.T. M GRADE SCORE</u>				
PARAGRAPH MEANING				
GRADE:				
1	1.5	1.5	1.5	1.5
2	1.8	1.9	1.7	1.8
3	2.6	2.9	2.3	2.4
4	3.3	3.4	2.6	2.9
5	4.4	4.3	3.1	3.6
6	5.3	5.3	4.3	4.7
ARITHMETIC				
3	3.1	3.0	2.3	2.9
4	3.8	3.9	3.4	3.4
5	4.3	4.4	3.7	3.9
6	4.8	5.0	4.0	4.5

TABLE 16
 M P.M. and ARITH. SCORES
 OF FOUR RACE-SEX GROUPS
 BY
 YEAR OF ENTRY INTO FIRST GRADE
1968

	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
<u>S.A.T. M GRADE SCORE</u>				
PARAGRAPH MEANING				
GRADE:				
1	1.5	1.5	1.5	1.6
2	1.7	1.8	1.6	1.5
3	2.9	2.8	2.0	2.4
4	3.3	3.3	2.6	2.9
5	4.6	4.2	3.1	3.7
6	-	-	-	-
ARITHMETIC				
GRADE:				
3	3.2	3.2	2.8	2.9
4	3.7	3.8	3.2	3.5
5	4.5	4.4	3.8	3.9
6	-	-	-	-

TABLE 17
 M P. M. and ARITH. SCORES
 OF FOUR RACE-SEX GROUPS
 BY
 YEAR OF ENTRY INTO FIRST GRADE
1969

	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
<u>S.A.T. M GRADE SCORE</u>				
PARAGRAPH MEANING				
GRADE:				
1	1.5	1.4	1.5	1.4
2	1.7	1.8	1.7	1.7
3	2.6	2.7	2.3	2.4
4	3.2	3.6	2.9	2.8
5	-	-	-	-
6	-	-	-	-

ARITHMETIC				
GRADE:				
3	2.8	3.0	2.8	2.7
4	3.5	3.9	3.3	3.3
5	-	-	-	-
6	-	-	-	-

TABLE 18
 M P. M. and ARITH. SCORES
 of FOUR RACE-SEX GROUPS
 BY
 YEAR OF ENTRY INTO FIRST GRADE
1970

	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
<u>S.A.T. M GRADE SCORE</u>				
PARAGRAPH MEANING				
GRADE:				
1	1.5	1.6	1.5	1.5
2	1.7	1.9	1.7	1.8
3	2.6	2.9	2.4	2.5
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

ARITHMETIC				
GRADE:				
3	2.3	3.0	2.8	2.9
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-

TABLE 19

M P. M. and ARITH. GRADE SCORES BY YEAR
OF ENTRY INTO FIRST GRADE

WHITE MALES

YEAR OF ENTRY INTO FIRST GRADE

	'66	'67	'68	'69	'70
--	-----	-----	-----	-----	-----

S.A.T. $\bar{M}$ GRADE SCORE

PARAGRAPH MEANING

GRADE:

1	1.5	1.5	1.5	1.5	1.5
2	1.8	1.8	1.7	1.7	1.7
3	2.5	2.6	2.9	2.6	2.6
4	3.1	3.3	3.3	3.2	-
5	4.1	4.4	4.6	-	-
6	4.6	5.3	-	-	-

ARITHMETIC

GRADE:

3	2.9	3.1	3.2	2.8	2.3
4	3.8	3.8	3.7	3.5	-
5	4.1	4.3	4.5	-	-
6	4.5	4.8	-	-	-

TABLE 20

M P. M. and ARITH. GRADE SCORES BY YEAR
OF ENTRY INTO FIRST GRADE

WHITE FEMALES

YEAR OF ENTRY INTO FIRST GRADE

	'66	'67	'68	'69	'70
--	-----	-----	-----	-----	-----

S.A.T. M GRADE SCORE

PARAGRAPH MEANING

GRADE:

1	1.5	1.5	1.5	1.4	1.6
2	2.0	1.9	1.8	1.8	1.9
3	2.9	2.9	2.8	2.7	2.9
4	3.6	3.4	3.3	3.6	-
5	4.9	4.3	4.2	-	-
6	5.5	5.3	-	-	-

ARITHMETIC

GRADE:

3	3.0	3.0	3.2	3.0	3.0
4	3.9	3.9	3.8	3.9	-
5	4.6	4.4	4.4	-	-
6	5.0	5.0	-	-	-

TABLE 21

M P. M. and ARITH. GRADE SCORES BY YEAR
OF ENTRY INTO FIRST GRADE

BLACK MALES

YEAR OF ENTRY INTO FIRST GRADE

	'66	'67	'68	'69	'70
--	-----	-----	-----	-----	-----

S.A.T. M GRADE SCORE

PARAGRAPH MEANING

GRADE:

1	1.4	1.5	1.5	1.5	1.5
2	1.7	1.7	1.6	1.7	1.7
3	2.2	2.3	2.0	2.3	2.4
4	2.6	2.6	2.6	2.9	-
5	3.7	3.1	3.1	-	-
6	3.9	4.3	-	-	-

ARITHMETIC

GRADE:

3	2.8	2.3	2.8	2.8	2.8
4	3.6	3.4	3.2	3.3	-
5	3.9	3.7	3.8	-	-
6	4.1	4.0	-	-	-

TABLE 22
M. P. M. and ARITH. GRADE SCORES BY YEAR
OF ENTRY INTO FIRST GRADE

<u>BLACK FEMALES</u>					
YEAR OF ENTRY INTO FIRST GRADE					
	<u>'66</u>	<u>'67</u>	<u>'68</u>	<u>'69</u>	<u>'70</u>
S.A.T. $\bar{M}$ GRADE SCORE					
PARAGRAPH MEANING					
GRADE:					
1	1.5	1.5	1.6	1.4	1.5
2	1.9	1.8	1.5	1.7	1.8
3	1.7	2.4	2.4	2.4	2.5
4	3.1	2.9	2.9	2.8	-
5	4.1	3.6	3.9	-	-
6	4.6	4.7	-	-	-
ARITHMETIC					
GRADE:					
3	2.9	2.9	2.9	2.7	2.9
4	3.7	3.4	3.5	3.3	-
5	4.4	3.9	3.9	-	-
6	4.4	4.5	-	-	-

TABLE 23

N and % of CHILDREN at or above GRADE LEVEL
 SELECTED ACHIEVEMENT TESTS
 (TOTAL SAMPLE)

<u>VARIABLE</u>	<u>NUMBER</u>		<u>PERCENT</u>
	<u>< GRADE LEVEL</u>	<u>≥ GRADE LEVEL</u>	<u>≥ GRADE LEVEL</u>
PARA MEANING			
GRADE:			
1	1056	96	8
2	963	183	16
3	791	123	13
4	608	83	12
5	400	66	14
6	207	45	18
ARITHMETIC			
GRADE:			
3	805	105	12
4	598	91	13
5	325	108	22
6	214	29	12
SPELLING			
GRADE:			
3	752	199	21
4	568	122	18
5	382	68	15
6	207	39	16

TABLE 24
 % of CHILDREN at or above GRADE LEVEL
 for SELECTED ACHIEVEMENT TESTS
 by RACE-SEX
 (TOTAL SAMPLE)

		<u>% at or above GRADE LEVEL</u>			
		<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
PARAGRAPH MEANING					
GRADE:					
1		7	10	4	10
2		18	23	19	14
3		23	17	3	8
4		22	14	2	4
5		25	17	2	7
6		24	23	4	12
ARITHMETIC					
GRADE:					
3		11	16	5	10
4		12	18	10	11
5		28	36	16	32
6		12	24	2	6

TABLE 25

% of CHILDREN at or above GRADE LEVEL
for all ACHIEVEMENT TESTS BY RACE-SEX
(TOTAL SAMPLE)

		<u>% at or above grade level</u>			
		<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
GRADE					
ONE					
	WORD READING	12	14	7	8
	PARAGRAPH MEANING	7	10	4	10
	VOCABULARY	34	24	14	12
TWO					
	WORD READING	16	24	11	18
	PARAGRAPH MEANING	18	23	19	14
	VOCABULARY	36	30	15	14
THREE					
	PARAGRAPH MEANING	23	17	3	8
	SPELLING	15	23	14	17
	ARITHMETIC	11	16	5	10
FOUR					
	PARAGRAPH MEANING	22	14	2	4
	SPELLING	18	22	9	19
	ARITHMETIC	12	18	10	11
FIVE					
	PARAGRAPH MEANING	25	17	2	7
	SPELLING	17	23	5	23
	ARITHMETIC	28	36	16	32
SIX					
	PARAGRAPH MEANING	24	23	4	12
	SPELLING	18	25	6	20
	ARITHMETIC	12	24	2	6

DATA ANALYSIS AND RESULTS

1. Perinatal Events

a. Effect of perinatal hypoxia-anoxia.

The strong correlation between I.Q. and reading achievement is well known. Hypoxia or anoxia is the most commonly encountered, detrimental perinatal event (Nelson, p. 378). It is manifest by cerebral palsy and mental retardation. The influence of hypoxia on the I.Q. of this study population is illustrated in the accompanying table. It shows the number of children in the indicated I.Q. ranges for the hypoxic group and the total sample, by Race-Sex groupings. Numbers in parentheses are M-SES's.

	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
Hypoxic sample				
<u>I.Q. Range</u>				
< 91	2(40)*	3(55)*	9(52)**	4(39)
91-110	11(53)	3(61)	4(55)	3(50)
> 110	6(59)	2(32)	1(60)	0
Total Sample				
< 91	69	78	89	74
91-110	192	191	92	99
> 110	50	46	9	2

* - one SES missing.

** - Two SES's missing.

White children in the hypoxic group have relatively more higher I.Q. scores and relatively fewer low I.Q. scores than the total sample. The reverse is true for Black children. The numbers here are quite small, too small to have statistical significance. As a matter of interest, however, the SES were determined to see if this might have a bearing on the results. There does appear to be a trend, excluding WF's, at higher I.Q. associating with higher SES, but, again, the numbers involved are very small.

SES scores are not available for these particular I.Q. ranges. The SES for the two races, sexes combined, for the hypoxic group are: White-53, Black-50; for the total sample White-56, Black-52. While interesting, the numbers are too small to demonstrate significance, and the difference of I.Q. and SES are miniscule.

b. Effect of neurological abnormality at birth.

Hypoxia or anoxia occurring in the perinatal period would result in a child's being labelled neurologically abnormal at birth. Neurological abnormality would also be diagnosed from brain injury stemming from difficult delivery, obstetric accidents (placenta abruptio, prolapsed umbilical cord, etc.), developmental defects of the central nervous system, and other conditions. Accordingly, the influence of neurological abnormality, of any origin, actual or suspected, upon third grade S.A.T. - P.M. scores was examined. Additional factors of

interest were also evaluated. These included race, sex, I.Q., SES, and various combinations of these.

The first two groups completing the third grade were Green and Yellow. The statistic employed was multiple regression. The mean grade equivalent score for paragraph meaning was 2.6, S.D. = 1.8. The correlation coefficient of each variable with P.M. is shown below, as is the multiple correlation coefficient.

<u>Variable</u>	<u>Correlation Coefficient</u>
Neurological abnormality	-0.06595
Gestational age	0.07469
Sex	0.18045
SES	0.18237
Race	0.24244
I.Q.	0.51358

In the interest of brevity, the various combinations of the above variables, which did not increase the size of the correlation coefficient of the single variables, are not shown.

The negative correlation coefficient for neurological abnormality is a function of weighting: normal (-1), suspicious (0), abnormal (+1).

The multiple correlation coefficient was 0.54855. The degrees of freedom 10 x 372, the F-value was 16.01. The p of

this F-value and these degrees of freedom is considerably less than 0.001.

We have performed many multiple regression analyses, using various grouping of predictor variables against achievement scores at various grades. This particular combination yielded the highest multiple 'r. A number of combinations yielded multiple r's in the range 0.50 to 0.55. F-values of 10, 12, 15, etc., in the face of an enormous number of degrees of freedom (large sample size) yielded p-values which were very small - in short, very strong statistical significance. This statistical significance is invariably due to I.Q., Race, SES, and Sex, when these four variables are employed. Their relative rank order is: I.Q. > Race > SES > Sex.

This particular analysis shows the very strong influence of I.Q., Race, SES, and Sex on reading achievement and the lack of influence of neurological status at birth.

c. Effect of birthweight.

Yet another perinatal variable is prominently associated with I.Q. scores; i.e., birthweight (B.W.) (Babson, 1969, a,b). Birthweight below or above a well-tested range is associated with less than average I.Q.

The effect of B.W. on I.Q. of the study sample, in grades one through five, is illustrated in the following table. There are three categories of birthweight: 2500 to 4249 grams, and a group above and below this usual, or average, normal range.

TABLE 26
CORRELATION OF BIRTHWEIGHT WITH I.Q.

AT 7 YEARS OF AGE

<u>Gr</u>	<u>RS</u>	<u>N₁</u>	<u>X₁</u>	<u>N₂</u>	<u>X₂</u>	<u>N₃</u>	<u>X₃</u>	<u>DF</u>	<u>F</u>	<u>p ≤</u>
								<u>2 x n</u>		
1	WM	14	99	263	99	14	98	288	.06	n.s.
	WF	21	93	268	99	6	101	292	2.77	n.s.
	BM	13	89	151	92	8	83	169	2.77	n.s.
	BF	26	92	128	92	2	86	151	0.33	n.s.
2	WM	13	99	257	99	17	97	284	0.24	n.s.
	WF	23	91	275	98	4	105	299	4.38	0.01
	BM	12	99	154	92	9	85	172	2.13	n.s.
	BF	27	93	136	92	1	95	161	0.08	n.s.
3	WM	13	99	234	100	15	96	259	0.55	n.s.
	WF	20	91	248	99	6	101	271	4.54	0.05
	BM	8	93	149	93	6	84	160	1.55	n.s.
	BF	26	93	130	92	2	86	155	0.42	n.s.
4	WM	11	95	153	100	11	102	172	1.16	n.s.
	WF	14	92	177	100	3	105	191	3.89	0.05
	BM	5	91	116	92	6	84	124	1.21	n.s.
	BF	19	93	97	93	1	95	114	0.03	n.s.
5	WM	5	99	79	100	5	97	86	0.14	n.s.
	WF	11	93	100	101	2	110	110	4.17	0.05
	BM	4	93	70	92	4	85	75	0.94	n.s.
	BF	13	95	59	93	1	95	70	0.24	n.s.

No correlations are recorded for grade six because the N in the above or below normal group, in each R.S. category is zero and the computer does not execute the program in this case.

The WISC Full Scale score is used in the determinations, not Verbal or Performance subtests.

The symbols in the immediately following table represent values as follows: N is number of children in a given category, $\bar{X}$ is $\bar{M}$ -I.Q. (Full Scale); subscripts as follows: 1-B.W. below 2500 grams, 2-B.W. 2500 to 4249 grams, 3-B.W. 4249 grams.

It can be seen that the only group showing any significant correlation with I.Q. is WF's in grades two through five. This stems from a relatively low I.Q. in the low B.W. group and a relatively high I.Q. in a very small number of high B.W. children. The WF's are the only group which show relative I.Q.'s in this pattern: lo B.W. < av. B.W. < hi B.W. Another way of stating this is that, for WF's only, low B.W. is detrimental and high B.W. advantageous. This clearly has no utility and is to be regarded as a statistical fluke, stemming from very large N's for the "middle" group, and very small N's in the "end" groups.

2. Three-Year Speech and Hearing Evaluation

a. Effect of three-year speech articulation test.

The following three tables show the correlation of elements of the speech exam administered at three years of age with

TABLE 27
CORRELATION OF 3-YEAR SPEECH EXAM (VOWELS & DIPTHONGS)
WITH READING ACHIEVEMENT

GR	RS	$\bar{N}_1$	$\bar{X}_1$	$\bar{N}_2$	$\bar{X}_2$	$\bar{N}_3$	$\bar{X}_3$	$\frac{DF}{2 \times n}$	$\bar{F}$	$p \leq$
1	WM	262	11	42	9	6	9	307	1.07	n.s.
	WF	270	12	26	10	3	14	296	1.41	n.s.
	BM	137	10	24	8	4	8	162	0.63	n.s.
	BF	147	11	21	9	-	-	165	0.69	n.s.
2	WM	267	22	39	18	6	19	309	1.92	n.s.
	WF	274	25	27	22	3	28	301	1.19	n.s.
	BM	153	19	27	16	4	18	181	0.62	n.s.
	BF	161	22	23	18	1	11	182	2.12	n.s.
3	WM	249	29	39	24	6	25	291	3.10	.050
	WF	259	32	24	26	2	36	282	3.18	.050
	BM	150	23	25	19	4	10	176	3.59	.050
	BF	158	25	24	23	1	9	180	1.40	n.s.
4	WM	197	39	29	33	4	34	227	2.54	n.s.
	WF	205	40	19	35	2	47	223	2.17	n.s.
	BM	123	29	24	26	2	26	146	0.61	n.s.
	BF	128	33	21	29	-	-	146	1.14	n.s.
5	WM	135	31	13	24	3	31	148	2.34	n.s.
	WF	148	31	12	23	-	-	157	2.84	n.s.
	BM	82	22	20	18	2	24	101	1.38	n.s.
	BF	103	24	11	23	-	-	111	0.09	n.s.
6	WM	64	36	8	34	2	37	71	0.09	n.s.
	WF	80	39	7	33	-	-	84	0.84	n.s.
	BM	62	27	8	27	-	-	67	0.00	n.s.
	BF	56	30	6	32	-	-	59	0.05	n.s.

TABLE 28
CORRELATION OF 3-YEAR SPEECH EXAM (INITIAL CONSONANT)
WITH READING ACHIEVEMENT

<u>GR</u>	<u>RS</u>	<u>N</u> ₁	<u>X</u> ₁	<u>N</u> ₂	<u>X</u> ₂	<u>N</u> ₃	<u>X</u> ₃	<u>DF</u> 2 x n	<u>F</u>	<u>p</u> ≤
1	WM	156	18	116	10	38	9	307	1.40	n.s.
	WF	183	13	92	11	24	10	296	2.24	n.s.
	BM	84	11	59	9	22	7	162	2.25	n.s.
	BF	116	11	46	9	6	5	165	2.40	n.s.
2	WM	157	23	119	19	35	19	309	5.20	.010
	WF	189	26	91	24	24	20	301	4.06	.050
	BM	94	20	69	16	21	18	181	2.87	n.s.
	BF	127	22	50	20	8	12	182	4.02	.050
3	WM	148	31	112	25	34	25	291	8.56	.001
	WF	177	33	89	30	19	28	282	2.64	n.s.
	BM	92	25	68	19	19	19	180	3.20	.050
	BF	126	26	50	22	7	18	180	3.20	.050
4	WM	123	40	77	36	30	34	227	3.65	.050
	WF	140	42	72	38	14	34	223	5.73	.010
	BM	76	31	57	26	16	25	146	3.26	.050
	BF	98	35	45	30	6	21	146	6.81	.010
5	WM	81	33	54	27	16	30	148	3.85	.050
	WF	96	32	57	29	7	24	157	2.54	n.s.
	BM	51	23	39	20	14	18	101	2.25	n.s.
	BF	77	25	34	21	3	26	111	2.38	n.s.
6	WM	39	39	27	31	8	39	71	3.29	.050
	WF	59	40	25	35	3	33	84	2.42	n.s.
	BM	43	26	21	27	6	29	67	0.30	n.s.
	BF	46	33	13	25	3	17	59	4.88	.050

TABLE 29
CORRELATION OF 3-YEAR SPEECH EXAM (FINAL CONSONANT)
WITH READING ACHIEVEMENT

Gr	RS	N ₁	$\bar{X}_1$	N ₂	$\bar{X}_2$	N ₃	$\bar{X}_3$	DF 2 x n	F	p ≤
1	WM	191	11	82	10	37	9.5	307	0.60	n.s.
	WF	200	12	69	11	30	9.5	296	3.07	.050
	BM	54	10	42	11	69	8.0	162	2.32	n.s.
	BF	69	13	60	10	39	9.0	165	3.45	.050
2	WM	200	22	79	21	33	18.0	309	2.21	n.s.
	WF	207	26	69	22	28	21.0	301	7.05	.001
	BM	57	21	52	19	75	16.0	181	4.15	.050
	BF	76	25	63	22	46	15.0	182	12.99	.001
3	WM	187	30	77	28	30	23.0	291	2.80	n.s.
	WF	197	33	63	28	25	27.0	282	5.23	.010
	BM	55	27	50	20	71	19.0	176	8.16	.001
	BF	77	28	61	24	45	19.0	180	10.15	.001
4	WM	144	40	59	39	27	27.0	227	10.39	.001
	WF	154	42	51	36	21	37.0	223	6.68	.010
	BM	51	32	39	29	59	25.0	146	4.85	.010
	BF	58	39	49	31	42	26.0	146	20.68	.001
5	WM	93	32	37	31	21	24.0	148	4.01	.050
	WF	106	32	39	27	15	25.0	157	4.72	.010
	BM	34	23	25	21	45	19.0	101	2.72	n.s.
	BF	42	29	45	22	27	19.0	111	11.29	.001
6	WM	45	38	17	36	12	28.0	71	3.65	.050
	WF	61	40	17	32	9	39.0	84	4.34	.050
	BM	24	26	20	26	28	67.0	67	0.18	n.s.
	BF	26	35	21	30	15	23.0	59	5.85	.010

reading achievement in indicated grade. The symbols are constant for the three tables: N is number of children in a category, $\bar{X}$ is $\bar{M}$ -S.A.T.-P.M., subscripts: 1-normal, 2-suspect, and 3-abnormal. The three-group classification is based on the number of correct responses made by the child. The X's are raw scores, not grade equivalent scores.

These tests require that the examinee reproduce sounds made by the examiner. Each examinee is placed in one of three categories, for each of the three tests, dependent upon the number of correct responses. The number of correct responses relegating a child to a particular cell is indicated in the following table:

	<u>Vowels & Diphthongs</u>	<u>Initial Consonant</u>	<u>Final Consonant</u>
Normal	14-16	15-23	11-23
Suspect	10-13	11-14	6-10
Abnormal	0-9	0-10	0-5

The quality of articulation of vowels and diphthongs is relatively non-discriminatory. It did not correlate with reading achievement, except for all R.S. groups, excluding BF's in the third grade. This response, however curious and unique, would appear to have little utility.

The capacity to articulate final consonants at age three years is strikingly correlated with subsequent reading achievement. This correlation is particularly impressive with respect

to females, black and white. The strong correlation extends from grade one through grade six.

There is a lesser degree of correlation with respect to males. There is strong correlation between response on final consonant articulation at age three years and reading achievement in grades four through six, for white males; grades two through four for black males.

Enunciation of initial consonants shows correlation with reading achievement in the middle grades, two or three through four, for all four R.S. groups.

3. Intelligence Quotient

a. Correlation between four- and seven-year I.Q.'s.

I.Q.'s were determined at four years of age (Stanford-Binet) and seven years of age (WISC). The four-year I.Q. determination is an uncommonly performed procedure and not generally available for a large sample. For this reason, the seven-year I.Q. is used for various analyses involving I.Q.

It was a matter of interest, however, to compare the four-year and seven-year I.Q.'s and determine whether there was any significant difference between the two.

I.Q.'s at both times were available on 1053 children. Forty-three children had the same numerical score on both tests; the score of 550 children was less on the 7-year than the 4-year test, the range of magnitude of change was 1 to 39

points; the score of 469 increased from 4 to 7 years of age, the magnitude of change was 1 to 29 points.

To test whether there was any significant change in either direction, the statistic to make inferences regarding the mean of a population of large sample size was used (Mendenhall).

This is $Z = \frac{\bar{Y} - \mu_0}{\sigma/\sqrt{n}}$ and σ is unknown. For σ , s was used, $s = \sqrt{\frac{\sum_{i=1}^n (Y_i - \bar{Y})^2}{n-1}}$ as an estimate of the mean.

The null hypothesis was that the mean change in I.Q. was not different from zero. Since $\bar{Y}$ is -0.96 and $s = 4.28$, the value of Z is almost 8. With an N of 1053, the statistical significance of this computation is enormous. It is largely due to the huge N , since the mean of the changes is only -0.96, functionally a meaningless number.

b. Descriptive features of seven-year I.Q. scores.

The following table indicates the $\bar{M}$ and S.D. for Full Scale, Verbal and Performance scores of the WISC for each of the indicated groups rounded to the nearest whole number.

	<u>Black</u>		<u>White</u>		<u>Total</u>		<u>Total</u>		<u>ALL</u>
	F.	M.	F.	M.	Bl.	Wh.	F.	M.	
F.S.									
$\bar{M}$	91	91	98	98	91	98	96	95	96
S.D.	12	11	13	12	11	13	13	12	13
V.									
$\bar{M}$	90	90	97	97	90	97	94	94	94
S.D.	12	11	12	12	11	12	13	12	12
P.									
$\bar{M}$	95	94	101	99	94	100	99	97	98
S.D.	12	13	15	13	13	14	14	13	14

The comparisons are obvious and are not unexpected. This table is presented principally to provide background information for evaluation of other presentations in this report and other studies of the reader's selection.

c. Distribution of I.Q. scores with respect to achievement.

The following tables are presented to see how useful might be broad ranges of I.Q.'s in predicting scholastic success in a very simple fashion - does the group achieve below grade level or not? The usual R.S. grouping are observed, for paragraph meaning and arithmetic computation only. The variable numbers refer to particular tests, indicated in Table 13; subscripts 1, 2, and 3 indicate the number below grade level in I.Q. ranges below 90, 90-110, and greater than 110, respectively, subscripts 1a, 2a, and 3a indicate at or above grade level, respectively.

It can be readily seen that, for each R.S. group, the percentage of children achieving at or above grade level increases with increasing I.Q. This increase is more prominent with Whites than Blacks, females than males. The number of Black children in the highest I.Q. group is very limited, however, and little can be made of this group.

Perhaps the most telling feature of this table, though, is the large fraction of children in the average and high I.Q. groups that do not achieve at grade level.

TABLE 30
NUMBER OF CHILDREN IN EACH I.Q. RANGE
ACHIEVING AT THE LEVEL INDICATED

WHITE MALES

<u>S.A.T. Var. No.</u>	<u>N</u> <u>1</u>	<u>N</u> <u>1a</u>	<u>N</u> <u>2</u>	<u>N</u> <u>2a</u>	<u>N</u> <u>3</u>	<u>N</u> <u>3a</u>
7	65	0	182	9	35	13
10	65	0	157	30	24	23
12	59	2	163	23	21	29
15	49	1	150	28	22	26
18	27	3	90	22	19	16
21	12	1	47	15	6	7
14	60	2	165	22	39	11
17	50	1	163	16	36	12
20	26	6	82	30	18	16
23	12	1	55	7	10	3

TABLE 31
NUMBER OF CHILDREN IN EACH I.Q. RANGE
ACHIEVING AT THE LEVEL INDICATED

WHITE FEMALES

<u>S.A.T. Var. No.</u>	<u>N</u> <u>1</u>	<u>N</u> <u>1a</u>	<u>N</u> <u>2</u>	<u>N</u> <u>2a</u>	<u>N</u> <u>3</u>	<u>N</u> <u>3a</u>
7	67	1	169	19	33	12
10	71	7	141	48	20	21
12	64	1	159	31	24	16
15	54	4	157	25	24	19
18	35	1	113	18	13	16
21	20	1	53	20	8	12
14	58	5	161	29	24	16
17	54	4	147	34	28	15
20	32	3	82	48	12	17
23	21	0	56	16	12	7

TABLE 32
NUMBER OF CHILDREN IN EACH I.Q. RANGE
ACHIEVING AT THE LEVEL INDICATED

BLACK MALES

<u>S.A.T. Var. No.</u>	<u>N</u> <u>1</u>	<u>N</u> <u>1a</u>	<u>N</u> <u>2</u>	<u>N</u> <u>2a</u>	<u>N</u> <u>3</u>	<u>N</u> <u>3a</u>
7	81	0	82	7	7	0
10	84	0	79	13	7	0
12	80	0	85	4	7	0
15	81	0	88	1	6	2
18	53	0	60	3	5	0
21	41	0	40	2	2	0
14	82	0	84	5	6	1
17	77	4	78	11	8	0
20	48	4	50	13	3	2
23	38	1	40	1	2	0

TABLE 33
NUMBER OF CHILDREN IN EACH I.Q. RANGE
ACHIEVING AT THE LEVEL INDICATED

BLACK FEMALES

<u>S.A.T. Var. No.</u>	<u>N</u> <u>1</u>	<u>N</u> <u>1a</u>	<u>N</u> <u>2</u>	<u>N</u> <u>2a</u>	<u>N</u> <u>3</u>	<u>N</u> <u>3a</u>
7	68	3	77	12	1	2
10	68	2	81	18	1	2
12	69	0	86	10	2	1
15	69	1	92	4	1	1
18	49	0	63	6	2	1
21	32	1	35	7	1	1
14	68	4	85	12	2	1
17	66	4	86	10	2	0
20	43	6	43	25	1	2
23	32	0	36	4	2	0

4. Pre-school Testing

a. Correlation between pre-kindergarten and pre-first grade Illinois Test of Psycholinguistic Ability (ITPA) and scholastic achievement.

This instrument was administered for the purpose of determining its capacity to distinguish between those children who achieve at or above grade level and those who do not. The sample used for standardization of the ITPA did not contain any Blacks (McCarthy and Kirk). We employed this test for both races, and the results are presented in the customary R.S. groupings.

No comparisons with standard scores are necessary in this exercise, since predictive value only is being sought.

The pre-Kg. and pre-1st results are presented side-by-side to facilitate comparisons. Chi-square comparisons are used. Because the number of degrees of freedom is not the same in all instances (zeroes in some cells required combining cells), only the value of Chi-square and the p-value are indicated.

The criterion variables are the S.A.T.-P.M. and Arith. computation, as indicated by the variable numbers noted in Table 13.

Correlation coefficients between all R.S. groups and the total score and all sub-test scores for the ITPA and pertinent criterion variables were determined. The correlation between the total score and criterion was higher than for any

TABLE 34

CORRELATION COEFFICIENTS BETWEEN S.A.T.'s
AND ITPA SCORES

<u>Var. No.</u>	<u>ITPA Score</u>	<u>CORRELATION COEFFICIENT</u>	
		<u>Pre-Kg.</u>	<u>Pre-1st</u>
7	Total	0.255	0.314
10	Total	0.318	0.409
12	Total	0.330	0.415
15	Total	0.270	0.389
18	Total	0.172	0.281
	A-V Assoc.	0.189	0.290
21	Total	0.105	0.257
	A-V Assoc.	0.116	0.286
14	Total	0.263	0.300
17	Total	0.204	0.288
20	Total	0.124	0.186
	V-M Seq.	0.140	0.200
	A-V Assoc.	-	0.190
23	Total	0.075	0.170
	A-V Assoc.	0.083	0.189

TABLE 35
CHI SQUARE COMPARISON OF PRE-SCHOOL ITPA
TOTAL SCORE AND S.A.T. ACHIEVEMENT
FOR
WHITE MALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>χ^2</u>	<u>$p \leq$</u>	<u>χ^2</u>	<u>$p \leq$</u>
7	20.4	.001	22.1	.001
10	18.9	.001	36.4	.001
12	15.5	.010	40.5	.001
15	17.2	.001	35.0	.001
18	12.9	.010	24.2	.001
21	9.6	.010		
14	6.13	n.s.	5.4	n.s.
17	4.59	n.s.	16.1	.010
20	9.60	.050	3.7	n.s.
23	1.78	n.s.	1.75	n.s.

TABLE 36
CHI SQUARE COMPARISON OF PRE-SCHOOL ITPA
TOTAL SCORE AND S.A.T. ACHIEVEMENT
FOR
WHITE FEMALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>χ^2</u>	<u>p</u>	<u>χ^2</u>	<u>p</u>
7	11.02	.020	23.6	.001
10	16.60	.001	47.4	.001
12	30.70	.001	44.3	.001
15	17.30	.001	52.9	.001
18	7.02	n.s.	25.3	.001
21	8.99	.020	25.7	.001
14	16.30	.001	19.7	.001
17	12.40	.010	13.9	.010
20	14.60	.010	9.96	.050
23	1.01	n.s.	7.34	n.s.

TABLE 37
CHI SQUARE COMPARISON OF PRE-SCHOOL ITPA
TOTAL SCORE AND S.A.T. ACHIEVEMENT
FOR
BLACK MALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>χ^2</u>	<u>p[≤]</u>	<u>χ^2</u>	<u>p[≤]</u>
7	5.66	n.s.	12.3	.010
10	9.58	.010	21.4	.001
12	11.40	.001	13.8	.001
15	6.73	.010	invalid	
18	invalid*		invalid	
21	invalid		invalid	
14	0.35	n.s.	2.10	n.s.
17	1.83	n.s.	7.89	n.s.
20	5.20	n.s.	2.90	n.s.
23	0.64	n.s.	0.15	n.s.

*invalid: at least one cell with value of zero unavoidable.

TABLE 38
CHI SQUARE COMPARISON OF PRE-SCHOOL ITPA
TOTAL SCORE AND S.A.T. ACHIEVEMENT
FOR
BLACK FEMALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>χ^2</u>	<u>$p^{\leq}$</u>	<u>χ^2</u>	<u>$p^{\leq}$</u>
7	9.88	.050	9.84	.050
10	29.30	.001	29.50	.001
12	15.70	.001	21.40	.001
15	0.06	n.s.	3.89	n.s.
18	11.12	.010	12.23	.010
21	6.26	.020	8.50	.010
14	3.69	n.s.	2.42	n.s.
17	11.80	.010	3.50	n.s.
20	13.30	.010	18.60	.010
23	4.27	.050	0.02	n.s.

subtest except as indicated below. When the correlation for total was not the highest, it was very close. The value of the correlation coefficients for total scores and criterion variables is presented in the following table. When the total did not show highest correlation, the subtest(s) with higher correlations are shown, as well. It can be seen that, for practical purposes, the total score has the highest or very nearly the highest correlation with all criterion variables. For this reason, the total score was used as the predictor variable vis-a-vis the criterion variables, as presented in the following tables.

The mean raw scores $\pm 1, 2$ and 3 standard deviations, for age, were used as intervals of comparison with the achievement score. If a given cell in the array used to compute the χ^2 were zero, it was combined with the next lowest interval with the invalid cells.

b. Correlation between pre-kindergarten and pre-first grade Metropolitan Readiness tests and scholastic achievement.

The Metropolitan was administered along with the ITPA, and the results treated in similar fashion. The following table indicates the correlation between S.A.T. scores and Metropolitan Readiness test total scores. When the correlation coefficient for total score did not show the highest value, the subtest(s) with higher values are indicated. The statistic employed to derive these coefficients was multiple regression

TABLE 39
CORRELATION COEFFICIENTS BETWEEN S.A.T.'s
AND METROPOLITAN READINESS TESTS

<u>Var. No.</u>		CORRELATION COEFFICIENT	
		<u>Pre-Kg.</u>	<u>Pre-1st</u>
7	Total	0.307	0.403
10	Total	0.326	0.494
12	Total	0.338	0.479
15	Total	0.247	0.400
18	Total	0.180	0.320
21	Total	0.106	0.300
	Copying	0.108	
	Numbers	0.113	
14	Total	0.233	0.379
17	Total	0.1996	0.336
	Copying	0.208	
	Numbers	-	0.339
20	Total	0.155	0.246
	Copying	0.158	
	Numbers	-	0.241
23	Total	0.080	0.204
	Copying	0.092	0.217

analysis.

As with the ITPA, it can be seen that the correlation with the total score was highest for most S.A.T. variables, or, if not, very close to that of the subtest(s) with higher correlations. Accordingly, total scores were used to derive the Chi Square tables which follow.

The interval scores for the Metropolitan were mean raw score $\pm$ 1, 2, and 3 standard deviations, appropriate for age, presented in the publisher's manual. The number of children achieving below or at or above grade level in each interval was counted and the Chi Square computed, for each of the R.S. groups, and for the variables indicated.

c. Correlation between pre-kindergarten and pre-first grade Bender-Gestalt test and scholastic achievement.

The Bender-Gestalt test was administered to the study-sample and was graded according to the Developmental Scoring System (Koppitz). The $\bar{M}$ and S.D. for grade, presented by Koppitz, are not whole numbers. For pre-Kg., the mean is 13.4 and for pre-1st is 8.1, no separation of sexes presented. These numbers represent number of errors made by the child in attempting reproduction of the Bender-Gestalt designs. Since any one child's score is always a whole number, we used whole numbers in construction of Chi Square tables. We determined the $\bar{M}$ and S.D. for our sample. Because the mean number of errors was much larger than Koppitz' sample, we

TABLE 40
CHI SQUARE COMPARISON OF PRE-SCHOOL
METROPOLITAN READINESS TEST
TOTAL SCORE AND S.A.T. ACHIEVEMENT
for
WHITE MALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>X²</u>	p	<u>X²</u>	p
7	28.6	.001	29.2	.001
10	22.5	.001	44.0	.001
12	12.8	.010	23.3	.001
15	.13	n.s.	19.5	.001
18	5.04	n.s.	10.1	.020
21	3.02	n.s.	12.1	.010
14	2.8	n.s.	18.8	.001
17	6.93	.050	10.9	.020
20	6.58	.050	5.73	n.s.
23	7.46	.050	1.99	n.s.

TABLE 41
CHI SQUARE COMPARISON OF PRE-SCHOOL
METROPOLITAN READINESS TEST
TOTAL SCORE AND S.A.T. ACHIEVEMENT
for
WHITE FEMALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>X²</u>	<u>p</u>	<u>X²</u>	<u>p</u>
7	24.8	.001	42.1	.001
10	40.2	.001	65.5	.001
12	34.1	.001	67.8	.001
15	25.3	.001	48.7	.001
18	7.2	.050	44.6	.001
21	18.3	.001	30.5	.001
14	17.6	.001	28.7	.001
17	8.2	.020	24.5	.001
20	13.2	.010	16.6	.001
23	9.3	.020	13.9	.010

TABLE 42
CHI SQUARE COMPARISON OF PRE-SCHOOL
METROPOLITAN READINESS TEST
TOTAL SCORE AND S.A.T. ACHIEVEMENT
for
BLACK MALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>X²</u>	<u>p</u>	<u>X²</u>	<u>p</u>
7	5.2	n.s.	5.4	.020
10	6.56	.050	20.4	.001
12	0.1	n.s.	10.3	.010
15	10.76	.010	19.3	.001
18	invalid		invalid	
21	invalid		invalid	
14	1.88	n.s.	3.03	n.s.
17	1.1	n.s.	0.54	n.s.
20	2.47	n.s.	8.90	.020
23	invalid		0.55	n.s.

TABLE 43
CHI SQUARE COMPARISON OF PRE-SCHOOL
METROPOLITAN READINESS TEST
TOTAL SCORE AND S.A.T. ACHIEVEMENT
for
BLACK FEMALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>X²</u>	<u>p</u>	<u>X²</u>	<u>p</u>
7	13.2	.010	41.8	.001
10	14.8	.010	23.9	.001
12	23.7	.010	26.6	.001
15	6.7	.050	9.7	.050
18	7.1	.050	48.3	.001
21	0.9	n.s.	12.7	.001
14	12.0	.010	15.8	.010
17	21.1	.001	11.9	.010
20	20.8	.001	19.7	.001
23	1.47	n.s.	17.5	.001

simply used intervals of two errors to construct the Chi Square table for pre-Kg., and an interval of one for pre-1st. This was done to provide greater discrimination. The tables immediately follow.

d. Correlation between laterality awareness in pre-school period and scholastic achievement.

Knowledge of right and left laterality awareness, as opposed to laterality preference for monomanual or monocular tasks, is tested according to the method of Piaget. This involved asking the child to show his right and left arm and leg, point to the same members on the examiner, tell the right-left relationships of two and three objects on a table in front of the examiner and identify the side on which the examiner wears a watch and in which hand a coin is held.

The test is scored by counting the number of correct responses, the maximum score is twenty.

Chi Square comparison between number of correct responses and whether child achieves at or above grade level or below grade level, for all R.S. groups, is presented in Tables 48-51.

e. Correlation between laterality in pre-school period and scholastic achievement.

Laterality, as used herein, is defined as a combination of handedness, the hand ordinarily used for monomanual tasks, and eyedness, the eye ordinarily used for monocular tasks. Laterality is said to correlate with reading achievement.

TABLE 44
CHI SQUARE COMPARISON OF PRE-SCHOOL
BENDER-GESTALT TEST SCORES AND
S.A.T. ACHIEVEMENT
for
WHITE MALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>χ^2</u>	<u>$p \leq$</u>	<u>χ^2</u>	<u>$p \leq$</u>
7	14.7	.010	10.5	n.s.
10	8.6	n.s.	20.1	.010
12	9.2	n.s.	8.3	n.s.
15	5.9	n.s.	7.2	n.s.
18	1.9	n.s.	3.0	n.s.
21	invalid		2.2	n.s.
14	4.4	n.s.	3.7	n.s.
17	14.6	.001	14.4	.020
20	3.4	n.s.	5.5	n.s.
23	invalid		0.3	n.s.

TABLE 45
CHI SQUARE COMPARISON OF PRE-SCHOOL
BENDER-GESTALT TEST SCORES AND
S.A.T. ACHIEVEMENT
for
WHITE FEMALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>χ^2</u>	<u>$p \leq$</u>	<u>χ^2</u>	<u>$p \leq$</u>
7	4.78	n.s.	31.1	.001
10	23.6	.001	18.1	.010
12	29.4	.001	22.3	.001
15	15.1	.010	15.9	.010
18	7.7	n.s.	10.2	.050
21	invalid		11.06	n.s.*
14	13.3	.050	17.4	.010
17	1.5	n.s.	14.6	.020
20	7.96	.050	6.3	n.s.
23	invalid		6.7	n.s.

* χ^2 of 11.07, $p \leq 0.05$.

TABLE 46
CHI SQUARE COMPARISON OF PRE-SCHOOL
BENDER-GESTALT TEST SCORES AND
S.A.T. ACHIEVEMENT
for
BLACK MALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>χ^2</u>	<u>$p \leq$</u>	<u>χ^2</u>	<u>$p \leq$</u>
7	0.8	n.s.	2.89	n.s.
10	17.1	.001	10.10	.020
12	invalid		0.9	n.s.
15	invalid		0.41	n.s.
18	invalid		0.48	n.s.
21	invalid		1.50	n.s.
14	invalid		13.2	.010
17	invalid		5.01	n.s.
20	invalid		3.05	n.s.
23	invalid		2.99	n.s.

TABLE 47
CHI SQUARE COMPARISON OF PRE-SCHOOL
BENDER-GESTALT TEST SCORES AND
S.A.T. ACHIEVEMENT
for
BLACK FEMALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>χ^2</u>	<u>p</u>	<u>χ^2</u>	<u>p</u>
7	8.19	.020	15.9	.001
10	2.58	n.s.	16.7	.001
12	2.06	n.s.	21.6	.001
15	1.60	n.s.	0.001	n.s.
18	6.59	.050	0.049	n.s.
21	invalid		2.36	n.s.
14	5.50	n.s.	17.7	.001
17	21.1	.001	8.9	.020
20	4.16	n.s.	2.7	n.s.
23	invalid		0.78	n.s.

There are three forms or types of laterality. The first, and most common, is "consistent" laterality, or consistent hand-eye correspondence; i.e., the hand and eye employed for isolated tasks are both on the same side of the body. Next most common is "crossed" laterality; i.e., hand and eye are on opposite sides of the body. The least common is "mixed" laterality or hand-eye correspondence. In this context, only one test, looking through a kaleidoscope, defines eyedness, hence it is never mixed. Monomaneual tasks in some people are done with the right hand, for some tasks, the left for others; these have "mixed" hand-eye correspondence.

The children were classified into six different groups, based upon laterality:

1. Consistent: a. right-handed and-eyed.
 b. left-handed and-eyed.
2. Crossed: a. left-handed and right-eyed.
 b. right-handed and left-eyed.
3. Mixed: a. right/left handed and right-eyed.
 b. right/left handed and left-eyed.

This data was utilized in performing two kinds of analyses, an analysis of variance (ANOVA) and Chi Square. The ANOVA was performed to determine the degree of correlation between the paragraph meaning (P.M.) score and the various hand-eye categories. The P.M. score was the only achievement variable

TABLE 48
CHI SQUARE COMPARISON OF RIGHT-LEFT
AWARENESS AND S.A.T. ACHIEVEMENT
for
WHITE MALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	χ^2	$p <$	χ^2	$p <$
7	3.01	n.s.	6.00	n.s.
10	5.35	n.s.	2.24	n.s.
12	5.99	n.s.	12.97	.050
15	7.29	n.s.	5.57	n.s.
18	4.65	n.s.	4.09	n.s.
21	4.38	n.s.	5.20	n.s.
14	9.75	n.s.	3.01	n.s.
17	1.48	n.s.	5.80	n.s.
20	2.40	n.s.	3.80	n.s.
23	0.19	n.s.	2.10	n.s.

TABLE 49
CHI SQUARE COMPARISONS OF RIGHT-LEFT
AWARENESS AND S.A.T. ACHIEVEMENT
for
WHITE FEMALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>χ^2</u>	<u>p</u> <	<u>χ^2</u>	<u>p</u> <
7	8.48	n.s.	10.1	.050
10	3.40	n.s.	7.6	n.s.
12	6.20	n.s.	3.1	n.s.
15	3.10	n.s.	6.2	n.s.
18	2.70	n.s.	2.9	n.s.
21	1.10	n.s.	4.1	n.s.
14	5.10	n.s.	2.75	n.s.
17	6.00	n.s.	4.10	n.s.
20	2.70	n.s.	11.56	.050
23	invalid		1.50	n.s.

TABLE 50
CHI SQUARE COMPARISONS OF RIGHT-LEFT
AWARENESS AND S.A.T. ACHIEVEMENT
for
BLACK MALES

<u>S.A.T. Var. No.</u>	<u>Pre-Kg.</u>		<u>Pre-1st</u>	
	<u>χ^2</u>	<u>p$\leq$</u>	<u>χ^2</u>	<u>p$\leq$</u>
7	0.7	n.s.	1.76	n.s.
10	5.1	n.s.	1.51	n.s.
12	0.8	n.s.	0.20	n.s.
15	1.6	n.s.	invalid	
18	invalid		0.20	n.s.
21	invalid		invalid	
14	3.7	n.s.	1.22	n.s.
17	0.7	n.s.	3.01	n.s.
20	0.8	n.s.	4.50	n.s.
23	invalid		0.20	n.s.

TABLE 51
CHI SQUARE COMPARISONS OF RIGHT-LEFT
AWARENESS AND S.A.T. ACHIEVEMENT
for
BLACK FEMALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	χ^2	$p \leq$	χ^2	$p \leq$
7	7.4	n.s.	7.08	n.s.
10	17.4	.010	4.60	n.s.
12	2.9	n.s.	3.20	n.s.
15	2.6	n.s.	1.30	n.s.
18	1.1	n.s.	2.90	n.s.
21	invalid		1.50	n.s.
14	8.5	n.s.	6.10	n.s.
17	4.0	n.s.	10.70	.050
20	2.7	n.s.	2.10	n.s.
23	invalid		4.50	.050

employed. F-values were determined for each R.S. group, grades one through six. None of the values was statistically significant despite the large N's employed. Thus, pattern of hand-eye correspondence did not "predict" reading achievement.

The frequency distribution of the types of hand-eye patterns in the four R.S. groups is shown by the following table (first grade only):

	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
Consistent:				
a.	197	175	94	101
b.	18	9	11	6
Crossed:				
a.	11	5	9	6
b.	104	135	68	65
Mixed:				
a.	14	14	7	8
b.	16	22	12	7

The same group of children should have been tested in grades one through three. There was variation, but quite limited, as shown by the total number of children tested at the end of the three grades who also had pre-1st grade laterality testing.

		<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
Grade	1	360	360	198	193
	2	365	368	212	212
	3	341	339	205	208

The Chi Square analysis was used to determine whether the pattern of hand-eye correspondence could be used to distinguish between those below grade level in P.M. only, and those not below grade level, for all four R.S. groups, grades one through six. Since ANOVA has indicated no significant difference between hand-eye patterns and $\bar{M}$ -P.M., grades one through six, the "a" and "b" groups (vide supra) for each of the three hand-eye patterns were combined. In summary, no statistically significant Chi-Square value was found in any of the twenty-four R.S. grade groups.

f. Correlation between the hand extension test of Schilder and reading achievement.

Silver and Hagin have correlated Schilder's test of cerebral dominance, hand extension, with reading achievement. This test is simply performed. The examinee is requested to close his eyes and extend both arms parallel to the floor, while sitting or standing, (done while sitting in this series of children). A normal response is said to consist of elevation of the arm used for writing with respect to the non-writing arm. Both arms at the same level or relative elevation of the non-writing hand is considered to be abnormal.

We administered this test in the pre-school period and compared the results with scores on P.M., only, grades one through four, all R.S. groups. The test was not administered to the Green group.

Since previous analysis had shown no correlation between the Schilder test and reading achievement (Isom, 1968) the data were analyzed in a different fashion. Only the Yellow and Pink groups were used. Since handedness or laterality preference is a developmental process; i.e., one in which an increasing number perform similarly with increasing age, we combined the results of the Schilder test in the pre-Kg. and pre-1st. The resultant was four groups: 1.) those with normal Schilder response in both pre-school periods; 2.) abnormal in pre-Kg., normal in pre-1st; 3.) abnormal both periods, and; 4.) normal in pre-Kg., abnormal in pre-1st.

An analysis of variance was performed. The results are presented in the following table. N is number in each group, subscripts corresponding to groups immediately above, $\bar{M}$ is mean paragraph meaning raw-score, df is degrees of freedom. As can be seen, there is no statistically significant correlation.

g. Correlation between orthography and scholastic achievement.

The ability to write the letters of the alphabet, correctly and in order, was determined in both pre-school testing periods. The score for this test was number written.

TABLE 52
CORRELATION BETWEEN HAND-EXTENSION TEST
and PARAGRAPH MEANING SCORE

	N ₁	M ₁	N ₂	M ₂	N ₃	M ₃	N ₄	M ₄	df	F-value
Grade 1									3 x	
WM	26	11	45	10	95	11	36	10	198	0.26
WF	30	12	57	13	81	13	46	11	210	0.88
BM	22	13	17	10	38	10	21	9	94	1.59
BF	12	11	22	9	36	14	32	11	98	1.89
Grade 2										
WM	29	17	45	21	86	22	34	20	190	1.45
WF	24	26	58	22	76	26	41	22	195	1.85
BM	21	17	19	15	42	20	24	16	102	1.41
BF	17	16	22	16	44	23	36	20	115	2.98*
Grade 3										
WM	15	30	29	32	50	28	26	29	116	0.38
WF	20	33	32	29	40	31	24	30	112	0.32
BM	15	19	15	18	22	26	18	22	66	1.68
BF	13	20	14	18	32	26	23	25	78	1.87
Grade 4										
WM	5	36	15	37	17	36	8	36	41	0.05
WF	6	37	19	35	15	38	14	40	50	0.42
BM	9	25	8	27	11	29	7	27	31	0.15
BF	6	37	8	31	15	34	11	74	36	0.57

*significant at 95% level of confidence.

Ability to write cardinal numbers, in order, was similarly assess.

The correlation between these two tasks and achievement in paragraph meaning and arithmetic computation is shown in the following tables.

The end-point was achievement at or above grade level or below grade level. The statistic employed was the Chi Square comparison. The results are presented in the following tables. A "p-value" equal to or less than 0.05 was considered to be statistically significant.

As can be seen from the tables, there is correlation to a significant degree between number of letters or numbers written correctly in order and subsequent achievement scores in reading and arithmetic computation. These "predictors" discriminated better between those who would and would not achieve at grade level for boys than for girls, for White than for Black. The pre-1st grade test was generally better than the pre-Kg. test in this regard.

Although very high Chi Square values are sometimes noted, with correspondingly very significant p-values, there is a limitation on their value. This is true of all the significant results in this analysis and is illustrated by the results of analysis of Black females, pre-Kg. test, number of numerals written versus 1st grade P.M. score. The Chi Square table is presented here:

TABLE 53
CHI SQUARE COMPARISON OF PRE-SCHOOL
ORTHOGRAPHY (NUMBER OF CORRECT LETTERS)
AND S.A.T. ACHIEVEMENT
FOR
WHITE MALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>χ^2</u>	<u>$p \leq$</u>	<u>χ^2</u>	<u>$p \leq$</u>
7	13.5	.001	35.3	.001
10	5.4	.020	41.0	.001
12	1.6	n.s.	9.8	n.s.
15	0.99	n.s.	25.5	.001
18	0.69	n.s.	18.3	.010
21	invalid		10.2	.050
14	2.6	n.s.	17.0	.010
17	3.1	n.s.	31.4	.001
20	invalid		15.6	.010
23	invalid		10.0	.010

TABLE 54
CHI SQUARE COMPARISON OF PRE-SCHOOL
ORTHOGRAPHY (NUMBER OF CORRECT LETTERS)
AND S.A.T. ACHIEVEMENT
FOR
WHITE FEMALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>X²</u>	<u>p</u> ≤	<u>X²</u>	<u>p</u> ≤
7	21.3	.001	26.7	.001
10	10.6	.010	22.9	.001
12	10.6	.010	18.7	.001
15	6.9	.050	44.0	.001
18	4.5	.050	38.6	.001
21	invalid		30.9	.001
14	14.99	.010	26.2	.001
17	2.7	n.s.	9.3	n.s.
20	6.2	.020	16.1	.010
23	6.1	.020	7.3	n.s.

TABLE 55
CHI SQUARE COMPARISON OF PRE-SCHOOL
ORTHOGRAPHY (NUMBER OF CORRECT LETTERS)
AND S.A.T. ACHIEVEMENT
FOR
BLACK MALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	χ^2	$p \leq$	χ^2	$p \leq$
7	8.72	.01	2.04	n.s.
10	2.94	n.s.	18.20	.010
12	4.83	.050	invalid	
15	20.70	.001	invalid	
18	3.97	.050	invalid	
21	invalid		invalid	
14	0.17	n.s.	6.8	n.s.
17	6.61	.050	4.2	n.s.
20	1.94	n.s.	11.6	n.s.
23	invalid		invalid	

TABLE 56
CHI SQUARE COMPARISON OF PRE-SCHOOL
ORTHOGRAPHY (NUMBER OF CORRECT LETTERS)
AND S.A.T. ACHIEVEMENT
FOR
BLACK FEMALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>X²</u>	<u>p <</u>	<u>X²</u>	<u>p <</u>
7	invalid		45.90	.001
10	invalid		20.40	.010
12	4.92	.05	52.90	.001
15	0.42	.01	0.08	n.s.
18	invalid		7.20	n.s.
21	invalid		28.70	.001
14	invalid		11.5	.050
17	invalid		15.5	.010
20	invalid		21.8	.001
23	invalid		4.5	.050

TABLE 57
CHI SQUARE COMPARISON OF PRE-SCHOOL
ORTHOGRAPHY (NUMBER OF CORRECT NUMBERS)
AND S.A.T. ACHIEVEMENT
FOR
WHITE MALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>X²</u>	<u>p</u> ≤	<u>X²</u>	<u>p</u> ≤
7	16.6	.001	44.4	.001.
10	16.3	.001	32.0	.001
12	7.1	n.s.	13.6	.010
15	3.7	n.s.	10.3	.050
18	7.5	n.s.	6.3	n.s.
21	0.3	n.s.	5.0	n.s.
14	3.1	n.s.	18.8	.001
17	0.5	n.s.	11.4	.050
20	0.1	n.s.	12.6	.050
23	invalid		3.2	n.s.

TABLE 58

CHI SQUARE COMPARISON OF PRE-SCHOOL
ORTHOGRAPHY (NUMBER OF CORRECT NUMBERS)
AND S.A.T. ACHIEVEMENT
FOR
WHITE FEMALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>χ^2</u>	<u>p<</u>	<u>χ^2</u>	<u>p<</u>
7	12.5	.010	22.9	.001
10	15.5	.010	16.2	.010
12	11.3	.020	32.3	.001
15	16.7	.001	11.6	.050
18	8.4	.010	14.5	.010
21	invalid		13.98	.010
14	16.5	.001	29.8	.001
17	6.1	n.s.	15.2	.010
20	1.9	n.s.	16.9	.010
23	6.1	.020	6.3	n.s.

TABLE 59
CHI SQUARE COMPARISON OF PRE-SCHOOL
ORTHOGRAPHY (NUMBER OF CORRECT NUMBERS)
AND S.A.T. ACHIEVEMENT
FOR
BLACK MALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>χ^2</u>	<u>$p \leq$</u>	<u>χ^2</u>	<u>$p \leq$</u>
7	.04	n.s.	6.5	n.s.
10	.30	n.s.	16.4	.010
12	4.90	.050	2.5	n.s.
15	9.50	.010	2.1	n.s.
18	invalid		1.6	n.s.
21	invalid		0.3	n.s.
14	invalid		7.70	n.s.
17	invalid		.43	n.s.
20	invalid		7.40	n.s.
23	invalid		0.80	n.s.

TABLE 60
CHI SQUARE COMPARISON OF PRE-SCHOOL
ORTHOGRAPHY (NUMBER OF CORRECT NUMBERS)
AND S.A.T. ACHIEVEMENT
FOR
BLACK FEMALES

<u>S.A.T. Var. No.</u>	Pre-Kg.		Pre-1st	
	<u>X²</u>	<u>p≤</u>	<u>X²</u>	<u>p≤</u>
7	45.8	.001	22.6	.001
10	14.6	.001	4.9	n.s.
12	26.9	.001	7.3	n.s.
15	10.1	.001	4.9	n.s.
18	25.1	.001	18.6	.001
21	invalid		16.9	.001
14	2.9	n.s.	20.7	.001
17	19.6	.001	13.5	.010
20	6.9	.050	16.6	.010
23	invalid		8.4	.020

<u>No. of numerals written correctly</u>	<u>Grade Level</u>	
	<u>Below</u>	<u>At or Above</u>
0	119	3
1	9	5
2	2	2
3	2	3
4	2	1
> 4	0	1

It is quite clear that those children writing more numerals correctly and in order show a higher percentage achieving at or above grade level in reading. The limitation in using this exercise as a predictor of reading achievement is that a considerable fraction of those performing relatively well on pre-school tests do not achieve at grade level, subsequently. On the other hand, the pre-school test is of value with respect to those achieving poorly in that poor pre-school performance is strongly indicative of poor scholastic achievement.

5. K-Means Cluster Analysis

This clustering technique divides a sample into a pre-determined number of subsets. The individual members of a given subset exhibit the least variation around the means of multiple parameters. As employed in this analysis, the parameters employed were the paragraph meaning scores for grades one through four, one set of analyses, and grades one

through six, in a second set of analyses.

Analyses were performed separately for each R.S. category, and for all four R.S. groups combined. The sample was divided, by the computer algorithm for this statistic, into three, four, and five subsets, or clusters. For the sake of space-saving, only the four-cluster analyses are presented.

A computer is required for this analysis, and it must be a fairly powerful one. A series of iterations are executed, the number of iterations is predetermined. We tried iterations varying from ten to fifty. We found no change after twenty iterations, and this was used as the standard number of iterations for each analysis.

The net result, in this particular case, is the delineation of four groups of individuals, the members of each group showing the least variation around the mean of paragraph meaning scores, grades one through four and one through six. Thus, each group exhibits the least variation not around one mean, but least variation around each of six means. To state another way, this technique portrays the mean reading achievement of several groups over time. Each group different from the others, but the individual members of a group similar to each other. Perhaps better stated another way - there is minimal intra-group variation and maximal inter-group variation.

The two tables immediately following present the results for analysis of grades one through four, and one through six.

TABLE 61
K-MEANS FOUR CLUSTER ANALYSIS: PATTERNS OF
READING ACHIEVEMENT ($\bar{M}$ -P.M. RAW SCORE) OVER TIME
(N's IN PARENTHESES)

<u>TOTAL SAMPLE</u>					
<u>R.S.</u>	<u>Grade</u>	<u>Lo-Lo</u>	<u>Lo-Intr</u>	<u>Lo-Hi</u>	<u>Hi-Hi</u>
WM		(31)	(28)	(28)	(12)
	1	6	9	10	28
	2	11	20	32	36
	3	12	24	40	47
	4	20	40	47	51
WF		(14)	(27)	(32)	(26)
	1	6	6	10	23
	2	9	19	32	32
	3	12	25	39	38
	4	17	38	47	44
BM		(25)	(22)	(19)	(33)
	1	6	7	9	16
	2	10	12	25	32
	3	10	19	25	37
	4	13	32	33	42
BF		(21)	(23)	(30)	(25)
	1	5	7	9	22
	2	12	20	27	34
	3	12	18	32	39
	4	17	34	36	44

TABLE 62
K-MEANS FOUR CLUSTER ANALYSIS: PATTERNS OF
READING ACHIEVEMENT ($\bar{M}$ -P.M. RAW SCORE) OVER TIME
(N's IN PARENTHESES)

<u>TOTAL SAMPLE</u>					
<u>R.S.</u>	<u>Grade</u>	<u>Lo-Lo</u>	<u>Lo-Intr</u>	<u>Lo-Hi</u>	<u>Hi-Hi</u>
WM		(23)	(2)	(22)	(14)
	1	8	7	10	23
	2	15	13	27	36
	3	14	10	33	44
	4	24	11	43	52
	5	17	26	21	47
	6	22	33	39	52
WF		(18)	(7)	(22)	(14)
	1	4	13	11	23
	2	15	33	31	35
	3	20	29	37	44
	4	30	43	44	49
	5	22	26	37	41
	6	28	35	42	48
BM		(17)	(25)	(12)	(5)
	1	5	7	12	30
	2	10	17	30	36
	3	10	19	36	39

TABLE 62 (cont.)

<u>R.S.</u>	<u>Grade</u>	<u>Lo-Lo</u>	<u>Lo-Intr</u>	<u>Lo-Hi</u>	<u>Hi-Hi</u>
BM (cont.)					
	4	13	32	40	44
	5	13	20	26	34
	6	15	25	39	38
BF		(22)	(19)	(11)	(7)
	1	5	11	10	25
	2	16	23	34	35
	3	15	28	36	40
	4	23	39	44	47
	5	18	26	31	42
	6	20	32	39	48

Since only individuals with scores for all grades examined can be included, the number of individuals diminishes, the broader the time-span represented by the achievement scores.

The pattern of P.M. scores suggested these categories of children, which are used as headings in the tables: Lo-Lo group children had relatively low scores in grade one, and low scores were maintained throughout the follow-up period; Lo-intr group children were low scoring early on, ultimately exceeded the Lo-Lo group, but not the other two groups; Lo-Hi group - began with low scores, finished with relatively high scores; Hi-Hi group - scored well throughout observation period.

6. Effect of Other Educational Experiences

a. Pre-school experience.

The number of children completing the first grade, without repeating, was 1253 (Table 3). Three hundred and twenty-two of this group attended kindergarten, sixty-seven attending nursery school in addition to kindergarten. An analysis of variance was performed by R.S. groups, comparing reading achievement with pre-school experience. The results suggested that the extra experience of nursery school benefited vis-a-vis those with only kindergarten. The Blacks showed better performance in grades one and two, not in grades three and four, the reverse was true to Whites. Although statistically significant differences were noted, they were

functionally meaningless. Here are two representative illustrations:

<u>Grade</u>	<u>R.S.</u>	N_1	$\bar{X}_1$	N_2	$\bar{X}_2$
1	BM	16	16	44	15 *
	BF	15	16	31	14 *

N_1 refers to those attending nursery school and kindergarten, N to kindergarten only. $\bar{X}$ is mean paragraph meaning score. The asterisk indicates significance with $p \leq .05$. The significance stems from a slight difference in mean scores and large N 's.

Children attending kindergarten were compared with those having no pre-school experience, or nursery school only, or day care, and a comparison between public and private kindergarten was made. The criterion variable was M-P.M., grades one through four. Occasional significant differences were noted, but they were functionally trivial. Analysis of variance was the statistic employed.

Comparisons between children attending Headstart plus kindergarten and kindergarten alone were performed for all four R.S. groups, grades one through four. Black females in grade one, and White males in grade three were the only instances in which significant difference in reading achievement was noted; again, the raw scores were separated by two points in the first grade, three in the third - hardly breath-taking differences.

b. Special services during the school year.

As the following table will indicate, the number of children receiving special treatment or instruction of whatever kind. These data are as of September, 1971.

<u>Grade</u>	<u>WM</u>	<u>WF</u>	<u>BM</u>	<u>BF</u>
1	137	84	90	53
2	120	79	60	43
3	82	57	57	49
4	40	35	33	27
5	12	18	11	12

There were several different kinds of special services rendered: special homeroom in which children designated "slow learner," "underachiever," or retarded or borderline I.Q. were placed. They received special attention throughout the school day, as opposed to those in special class, receiving special attention only in that class. Examples of the latter are remedial reading, readiness class, tutoring, etc.

Some children were placed in behavior modification classes. These classes were usually supervised by, or conducted in concert with teachers, by a psychologist and/or physician with particular interest in behavior modification. Opportunities for placement in such classes were limited and the children were extensively screened before placement.

Other special services included individual counselling by a psychologist or social service worker, group counselling,

speech therapy, extended day care, special classes for immature first-grade children, organized voluntary tutoring, etc.

The teacher supplied the information regarding receipt of special services, usually in response to a questionnaire only; sometimes coupled with a telephone call or direct interview.

The percentage of all children, having completed a given grade, receiving some kind of special services in that grade is presented in the immediately following table:

<u>Grade</u>	<u>No. completing grade</u>	<u>No receiving special services</u>	<u>% receiving special services</u>
1	1154	364	31.5
2	937	302	32.2
3	644	245	38.0
4	383	133	34.7
5	145	53	36.6

These figures were obtained immediately after the entire study-sample had the opportunity to complete at least the first grade (summer-1971). It was not anticipated that increasing the N's for grades 2-5 would alter the percentage results. No data are presented for grade six because the small number of students and several categories of special services results in vanishingly small numbers in the various service categories. This is true, also, but to a lesser degree, for the fifth grade.

As can be seen, although in excess of one third of the sample receives special services, on a cumulative basis, this is still considerably less than the percent, approximately eighty, achieving below grade level, over the six grades.

7. Differential Achievement

Although there may be small subgroups which belie this statement, and no diligent search was made for them, the mean level of achievement of the four race sex groups over the first six grades does not support the concept of specific learning disorder.

Table 13 presents the mean scores for all S.A.T. It would be expected that such a poorly performing group would have a large number of children with specific disabilities, if, in fact, this is a definitive entity. Tables 14 through 22 permit comparison of scores of smaller groups, in which discrete subsets should be more readily detected, and do not disclose differential achievement.

Our experience with poor readers had shown that they performed poorly in arithmetic and spelling, individually, and as a group. The relative level of achievement is fairly equal in all areas, in the current study sample, although there are some limited variations from year to year and group to group.

DISCUSSION

1. Perinatal Events

a. Effect of perinatal hypoxia-anoxia.

Hypoxia is a term describing any situation in which the supply of oxygen to the brain is inadequate, but not totally deficient. Anoxia describes any situation resulting in total lack of oxygen to the brain. Both terms represent clinical diagnoses. The occurrence of oxygen deficit can be determined reasonably well, but the severity of the deficiency and its duration can be described only in semi-quantitative terms.

Anoxia of more than about three minutes duration is incompatible with life. Hypoxia at birth probably occurs much more frequently than anoxia, and the mere occurrence of hypoxia does not necessarily result in injury to the central nervous system.

Hypoxia/anoxia is the most commonly encountered, detrimental perinatal event. It results in mental retardation and cerebral palsy. These two conditions, particularly the latter, are often diagnosed before the affected child is eligible for regular public school classes. Mental retardation of mild degree may not be diagnosed until the child has entered school. Once diagnosed, children with these handicaps will be placed in special classes.

The distribution of I.Q.'s of children in the hypoxic/anoxic group does not differ notably from the total sample,

indicating that the perinatal insult was not of sufficient intensity or duration to cause brain damage. Had serious brain damage occurred, the affected children very likely would not have been available for enrollment onto the Reading Study.

b. Effect of neurological abnormality at birth.

The neurological examination of the newborn is a rather crude analytic tool. It is applied to a difficult task - the functional evaluation of an immature, evolving, biological structure. The net assay is in terms of normal, or a negative deviation from normal. Superior status or a positive deviation from normal is not detectable.

Neurological dysfunction at the time of birth, particularly if acquired just before or during labor and delivery, may be transient or permanent. If the latter, greater or lesser degrees of compensation may occur.

A child labelled definitely abnormal at birth might be expected to show permanent dysfunction later in life than one labelled neurologically suspicious or normal at birth. Children with definite abnormality (mental retardation or cerebral palsy) will not have come under our purview, in most instances. Further, cerebral palsy's prevalence, about 100 per 100,000, precludes a significant contribution to this study population (Nelson, p. 312).

Considering all of these factors, the age and circumstances under which the children were selected for inclusion in this study, it is not surprising that neurological status at birth is insignificant re reading achievement.

c. Effect of birthweight.

Birthweight is well correlated with I.Q. (Babson, 1969, a,b). Small birthweight may reflect short gestation (prematurity), placental dysfunction resulting in a poorly nourished fetus, developmental anomalies, or infection acquired in utero. Large birthweight may reflect maternal problems, e.g., diabetes mellitus, or developmental disorders. In addition to the primary disorder responsible for aberrant size, there is the added problem of increased mechanical hazard of delivery. The premature has increased incidence of breech delivery, the larger fetus is simply more difficult to deliver.

Just as with hypoxia/anoxia, and other processes producing neurological abnormality at birth, it was not anticipated that effect of birthweight would be apparent in this sample. Any serious influence upon I.Q. or production of neurological abnormality probably would have diverted the affected child into special programs which would have precluded our finding him in regular school classes.

The WF's show a statistically significant influence of B.W. on I.Q. through these grades because the I.Q. of the < 2500 gram group is low, lower than in the other three

3. Intelligence Quotient

It is obvious that, compared to the White sample, the Black sample is under represented in the highest I.Q. range and over represented in the lowest I.Q. range.

The most striking presentation, though, is that a majority of children of average normal I.Q., in all R.S. groups, will perform at below grade level, in reading achievement and arithmetic computation, in grades one through six.

Possessing I.Q.'s above average normal range is no guarantee of performance at or above grade level. Performance by Whites is relatively superior to Blacks, but the number of Blacks in the highest I.Q. group is too small to have significance. Amongst the Whites, from one-fourth to one-half of the highest I.Q. group perform at or above grade level. Regardless of Race-Sex designation, a child in this sample with an I.Q. below 90 will almost certainly not achieve at grade level in reading or arithmetic computation, at any grade. A few do, but the numbers are so small as to be functionally meaningless.

The number of Blacks in the group with I.Q.'s over 110 is so small that meaningful analysis cannot be made. The Whites in this I.Q. range have a lesser percentage of those achieving below grade level than the other two I.Q. groups, but the majority are below grade level in achievement. Females, in general, performed better than males among the high-I.Q. Whites.

The mid-I.Q. group, also the largest in size, showed differences between races and sexes. Females did better than males, regardless of race, and Whites did better than Blacks at comparable I.Q. levels. Again, these rather unimpressive differences are overwhelmed by the fact that the majority of children with normal or average I.Q.'s, regardless of race or sex do not achieve at grade level.

4. Pre-School Testing

a. Predictive ability of I.T.P.A. and Metropolitan tests.

The pattern of correlation between results of scores on the pre-school I.T.P.A. and Metropolitan tests and scores on achievement tests of paragraph meaning and arithmetic computation are quite similar and will be considered together.

It is obvious that highly significant correlations exist between the pre-school test scores and achievement scores. The correlations are greater for Whites than Blacks, for females than males, and greater for pre-1st than for pre-Kg. The principal reason for this, regardless of R.S. category or time of test, is that the vast majority of those with low pre-school test scores do poorly in school, and a significant fraction, but still less than half, of those with higher scores achieve at or above grade level. The general pattern of Chi Square tables is presented herein:

<u>Pre-School Test Score</u>	<u>Achievement Level</u>	
	<u>Below Grade</u>	<u>Not Below Grade</u>
Lower Score	N ₁	N ₃
Higher Score	N ₂	N ₄

N₁ is the largest number of the four in the table, N₃ the smallest. N₂ and N₄ are both relatively small, and are between N₁ and N₃ in absolute value. N₂ is generally larger than N₄. When more than two rows were present, as was usually true, the same general trend prevails.

The general pattern is that a low pre-school score almost certainly predicts below grade-level achievement, a higher pre-school score does not predict achievement at or above grade level, but most of those achieving at or above grade level achievement had higher pre-school scores.

b. Predictive ability of the Bender-Gestalt test.

The Bender-Gestalt test, scored according to the method of Koppitz, was not a particularly valuable tool for predicting scholastic achievement in this sample. The test is scored according to the number of errors made. The number of errors made was quite large, even by those with the best scores. This does not permit much discrimination and is responsible for the lack of power as a predictor.

The discriminating capability was better with respect to females than males, and for Whites than Blacks. The statistically significant results, when found, reflected the

same pattern as the I.T.P.A. and Metropolitan - lower pre-school scores correlate with lower achievement in almost all cases, higher pre-school scores are associated with a much higher percentage of success, although the majority do not achieve at or above grade level.

c. Predictive ability of laterality awareness.

In contrast to the results of Birch, we do not find correlation between the laterality awareness test of Piaget and reading achievement.

Laterality awareness is a developmental process as measured by this test in that the number of correct responses increases with age. The lack of correlation is due to the fact that the number of correct answers in this sample was quite small and there was simply not sufficient power for discriminating among the individuals of a large sample.

Possible explanations for lack of discriminating ability of this test are that it is not suitable for a group with low SES; that the test is not suitable for the pre-school age group; or, that this sample is developmentally immature.

d. Correlation between laterality preference and scholastic achievement.

Tables displaying data to support the conclusion that there was no correlation between pattern of laterality preference (hand-eye correspondence) and reading achievement and that laterality preference in the pre-school period does not

distinguish between those below grade level and not below grade level are not presented. The only reason for not including these tables is that there seemed to be no merit to further expanding an already voluminous report with uninteresting tables.

The pre-school laterality preference test (pre-1st) was administered to all five color groups. The table on page 90 was constructed to determine if there were any disproportionate changes in sample size of any of the R.S. groups over time. Since the third grade is the highest grade completed by all color-groups, this was the highest grade in which change was looked for. As can be seen, the number of Whites decreased slightly and the number of Blacks increased slightly. This was not a unique feature of the children in the Reading Study. This change reflected a change in the make-up of the sample of the Collaborative Study at the University of Oregon Medical School and, in turn, reflects population change in municipal Portland, which will be discussed further in a later section.

e. Correlation between the hand-extension test of Schilder and scholastic achievement.

Our results do not replicate those of Silver and Hagin; however, our samples are not comparable. The children examined by Silver and Hagin were older at the time of administering the Schilder test and they were in a private school in the city of New York.

Schilder regarded his test as a measure of cerebral dominance. Dominance as operationally measured is a developmental phenomenon. The number of children showing adult patterns progressively increases up to about age twelve years, at which time adult patterns are reached. Perhaps Schilder's test simply is not of correlative value at the age used in this study.

Since the test was administered twice to many in this sample, the patterns of response over the interval pre-Kg. to pre-1st were correlated with scholastic achievement. Those showing Schilder's normal response both times were considered to be "mature", those showing normal response only in pre-1st were considered to be "maturing", those with abnormal response on both tests were labelled "abnormal", and those with normal pre-Kg. and abnormal pre-1st were labelled "aberrant." These four groups were used in an ANOVA to determine correlation between pattern of Schilder test-response and reading achievement (P.M.), only grades 1 through 4 were used. The test was not administered to the Yellow group, and, perforce, could not be administered to the Green group. For this reason, the Schilder test was compared with achievement scores only through the fourth grade since the numbers in fifth grade were quite small.

The results are presented in Table 52, and indicate that, for preschool children, the test does not correlate with achievement.

f. Correlation between orthography (letters and numbers) and scholastic achievement.

As has already been stated (Isom, 1968), the number of letters of the alphabet and the numbers 1-20, written in order and orthographically correct correlates with reading achievement. Poor readers perform these tasks poorly, good readers do well.

The power of these skills as predictors of reading achievement is similar to that of I.T.P.A., Metropolitan, I.Q., and others. Those doing poorly on the pre-school test achieve poorly; a small absolute number of children do well on the predictor test, and a significant fraction of these achieve relatively well.

5. K-Means Analysis

This is a clustering technique, the purpose of which is to divide the individual members of a sample into subsets so that the members of a given subset resemble each other, with respect to multiple parameters, more than they do members of other subsets.

The parameters employed here were P.M. scores, grades 1-4, and 1-6. The sample can be divided into as many subsets as desired, with the constraint that size of sample limits the number of operationally useful subsets. We analyzed the results of dividing the sample into two, three, four and five subsets. Since each individual must have a value for each

parameter (P.M.) employed, this acts as a constraint upon the number of subsets, or cluster, feasible. As the number of clusters increases, the N in each cluster decreases, and can rapidly become so small as to be meaningless.

We found four clusters quite suitable for the sample size represented by the first four grades, and this number of clusters was employed in looking at results of grades 1 through 6, even though the cluster size was sometimes quite small.

The algorithm for this clustering technique results in determination of a mean score for each cluster, and an individual score for each member of the cluster. This mean score, and individual scores, is "distance from center of cluster." This is a statement of the degree of variation about the mean shown by the individuals in the cluster. The extreme deviations, if present, can be removed from the cluster, if desired, thereby increasing the homogeneity of the cluster. Since we were interested only in determining whether unique patterns of achievement over time were present, and these were found, we did not attempt further refinement of clusters.

If one wishes to study processes or mechanisms, this refinement can be employed to group the more comparable individuals and identify or segregate the extreme or aberrant individuals.

These data in tables 61 and 62 indicated that relative performance in reading in later grades was already established by the second grade. Those reading well in grades 1 and 2

continue to do so through grade 6; those reading very poorly in grades 1 and 2 remain very poor readers. There are two intermediate groups. Both begin poorly, one makes a relatively large advance in achievement by end of second grade, the other, not until grade 3 or 4. This is shown better in Table 61 than 62. The reason is that the cluster size is larger in the former table.

In preparing Table 61, the R.S. group with the smallest N was the standard, the same number of cases were examined in the other three R.S. groups. In preparing Table 62, all cases available were used. All R.S. groups exhibit all four patterns of achievement, but the proportions vary.

The reader is advised that these are raw scores, and raw scores for the test employed for grades 5 and 6 are not comparable with those in grades 1 through 4.

The mean SES and I.Q. of the students in the four K-Means categories, all R.S. groups combined, was determined. The results are as follows:

	<u>SES</u>	<u>I.Q.</u>
Hi-Hi	60	103
Lo-Hi	55	96
Lo-Int	53	97
Lo-Lo	49	87

The magnitude of the relative differences is consonant with that of the levels of reading achievement. The principal difference exists between the two extreme groups, the two

middle groups being quite similar. There is nothing particularly surprising in these findings. They simply reaffirm the relatively constant influence of SES and I.Q. on the various subgroups of this study sample.

Using these groups, and "working back," it was found that the relative performance in reading achievement of these groups was associated with comparable performance on the 3-year speech examination.

6. Effect of Other Educational Experiences.

The children in this sample did poorly, as a group, re scholastic achievement. Many in this group were the recipients in pre-school and school years of special attention and instruction, largely through programs directed to children in low-income families. It may be possible to detect beneficial effect of a given program, but casual inspection of the overall achievement of this sample indicates that whatever might have been done was not a powerful determinant or elevator of this sample's scholastic capabilities.

7. Differential Achievement

Although not a stated goal of this study, one offshoot of it is the opportunity to examine the relative level of achievement in reading, spelling, and arithmetic computation.

This comparison addresses itself to the possibility of discerning any distinctive achievement in one area with respect to another. It is conceivable that a small number of

students, unobtrusively embedded in a large sample, might exhibit a pattern of accomplishment quite different from the larger sample. No particular effort was expended in determining the existence of such a small group.

It was of interest, however, to ascertain, by visual inspection, the mean level of achievement of all four race-sex groups, over grades one through six, in the larger sample. It seems not unreasonable to anticipate that there were not any subgroups, of meaningful size, contained within the larger group. Their presence would be detected by a significant deviation of mean achievement levels in one area, as opposed to another. Such variations were not found. This is borne out by Table 13, showing mean achievement scores for the total cohort and Tables 14 through 22, which illustrate the same lack of specific disability for groups of smaller size.

More powerful analytic tools are available to be addressed to this consideration. This was not done, however, because detection of children with noticeably discrepant performance in two or more areas was not a feature of this study.

8. Extraneous Influences

a. Change in pre-school experience.

The Head Start and Model Cities programs were introduced into the greater Portland area coincident with the inception of this study. Children in corporate Portland could have been

in both programs. Head Start, only, was available in the non-corporate, metropolitan area.

The earlier years of these programs were marked by less enthusiastic reception by eligible families than in later years. Consequently, a larger percentage of eligible children participated in later years. Some children attended Head Start programs only one year, some two. The effectiveness of organizational structure, development of programs, in general, the quality of the Head Start project, as described by teachers and administrators in the program, improved over time.

Only 198 children of all completing first grade in this study were in Head Start. This was the maximum number in any grade. The two largest groups were Blacks in one area of Portland, and Whites in suburban or semi-rural areas.

It was felt that the variable duration and nature of experience, the contrast in the groups constituting the bulk of children in Head Start programs, and their limited number, made further analysis of this group as a separate entity not feasible. This decision was further influenced by the fact that it was not intended that the influence or role of Head Start and Model Cities be studied. In fact, when this study was conceptualized, the project director was unaware of the nature and possible extent of these programs.

b. Change in instructional systems.

The school district serving the largest fraction of our cohort is that of Portland, Oregon. A system-wide change in

reading instruction was instituted in Portland in the fall of 1969. All children, beginning in grade one, and extending through grades three or four, were instructed in reading with S.R.A. materials and techniques. This excluded a small pilot study being instructed with the Initial Teaching Alphabet (i.t.a.).

The teachers of the children using S.R.A. materials maintained that the children were penalized in the early grades because the S.R.A. approach does not permit children to read as well, in early grades, as those taught with traditional techniques. Comparison of mean scores for those completing the first three grades, before and after 1972 does not reveal any differences.

The i.t.a. approach was used in only one school, as far as is known, and this involved a vanishingly small number of children in the study.

c. Change in test-taking attitudes.

The children examined in the pre-school period during the first years of the study were excessively shy, very quiet, reluctant to participate, and, in general, were awkward, ill-at-ease, and unaccomplished in executing paper-and-pencil tests. During the latter part of the study, the pre-school children were obviously much more comfortable taking the tests, more outgoing, and clearly more adroit and cooperative in the testing procedures, although their overall performance did not exceed their predecessors.

d. Change in study population and ratio of Black to White.

The Child Development Study changed the method of selection of pregnant women to be enrolled. These changes were reflected in changes in numbers of children in the Reading Study in subsequent years (Table 1). The purpose of the changes was to obtain the maximal number which could be comfortably studied and to secure maximization of random selection among the pool from which the pregnant women were selected.

There was a change in the ratio of Black to White children during the years of the study. Although metropolitan Portland increased in population, municipal Portland diminished in population. Within the Portland school district, the total number of those enrolled decreased, the number of Whites decreased, the number of Blacks increased.

Table 3 demonstrates this. The cumulative ratio of Whites to Blacks in early grades is almost two-to-one, in later grades, almost one-to-one, reflecting the relatively large White majority in the early years of the study.

Tables 4 through 8 also indicate a relatively greater retention of Blacks than Whites in the study, later as opposed to earlier years of the study. Tables 9 through 12 show the same thing in a different way.

The absolute reduction in size of cohort ("lost to follow-up"), as reflected in decreasing numbers of S.A.T. scores obtained for a given group over years was a result of several

factors.

Some families moved out of the area and were never located. Others were located, but testing materials forwarded to their teachers were not returned. Of those remaining in the area, some could not be located or tested, if located, for a variety of reasons.

As this study was progressing, the reduction in sample size was noted and periodic examination of those lost was made. This consisted of comparing various parameters of those lost with those remaining, of comparable race-sex. The parameters used were S.E.S., I.Q., scores on pre-school tests, and scores on S.A.T.'s. We could detect no difference between the groups and concluded that no obvious bias was determining the loss. It is to be noted, however, that relatively and absolutely more Whites than Blacks were lost.

SUMMARY

The ultimate purpose of this study can be regarded as an attempt to determine, as early as possible, whether a given child will or will not read at grade level, at some point in the first six grades. It was considered that spontaneous change after grade six was unlikely.

If a reliable predictor of poor reading could be developed, presumably, these children could receive special instruction at any early age. If effective special instruction could be developed and applied before failure becomes apparent, the stigmata associated with failure, per se, could be avoided.

The cohort chosen for this study was unexpectedly very poorly accomplished in school. They were relatively homogeneous in this regard. The limited range of achievement at any grade, in retrospect, would limit the effectiveness of any predictor. In other words, exceptionally powerful predictors would be required to meaningfully discriminate between individuals in the cohort, or between groups of individuals.

We did not find predictors of great power. We found correlation coefficients on the order of 0.3 to 0.4 between a number of individual predictors and criterion - reading achievement. The largest correlation coefficient, a multiple correlation coefficient, was between 0.5 and 0.6. This was a combination of S.E.S., I.Q., race and sex. (These variables are not independent of each other.) A correlation coefficient

("r") of 0.5, with a large sample size, is highly significant, in that the observed relationship is almost certainly not due to chance. However, since an "r" of 0.5 only accounts for 25% of the variance between predicted and observed results, it is not very meaningful or useful; i.e., other factors, presently undetected, are more influential (Craddock; Mendenhall.)

Although relatively weak as pure predictors, several parameters permit division of the cohort into two groups. One group performs poorly on the three-year speech test and certain pre-school tests; Metropolitan, I.T.P.A., and other, less involved, tests. This group will almost certainly do poorly on reading. Lower I.Q. and lower S.E.S. accent this prediction. Given a pair of children having these characteristics, a boy will more likely have difficulty than a girl, a Black than a White.

The converse is true, in a somewhat more limited degree. Almost all of those with poor scores on the predictor tests will do poorly in reading. Some, but by no means all, of those with better scores on predictor tests will read relatively well.

Reading achievement scores at end of first grade offer a point of confirmation of pre-school prediction. The child reading well will probably continue to do so, those reading very poorly are likely to remain poor readers. Reading achievement at end of second grade, combined with first permits

stronger predictors. Those doing well and those doing very poorly continue in this pattern. An intermediate group is designated, the members of which will exhibit relative increase in reading proficiency at different grade levels between grades two and five.

These conclusions are applicable only to this cohort, one characterized by low I.Q. and low S.E.S. However, since these characteristics describe a significant number of children in public schools, they may permit an earlier, and hence more effective, allocation of special resources.

CONCLUSIONS

1. Perinatal Events.

- a. The children in this study experiencing perinatal hypoxia or anoxia did not sustain insult of sufficient intensity to impair their intelligence.
- b. The neurological status at birth, of this study population, is not significantly related to reading achievement.
- c. Birthweight has insignificant correlation with I.Q. in this study-sample except for WF's in grades two through five. The significance of the relationship in WF's is spurious because of the very small N's in the lowest and highest B.W. groups. The low B.W. appears to be detrimental, the high B.W. advantageous. This is clearly inconsistent with medical experience and is to be considered a statistical fluke because of the magnitude of the various N's involved.
- d. The four most powerful predictors of reading achievement in this study are, in descending order of magnitude: I.Q., Race, SES, Sex. Their influence is far greater than the effect of perinatal events or neurological status at birth.

2. Three Year Speech Evaluation.

- a. Speech production at three years of age, representing a relatively easily administered, brief test, shows

strong correlation with reading achievement during grade school. The association is stronger for females than males, and stronger for White than Black males. Articulation of final consonants is strongly correlated with reading achievement, initial consonants less so, and vowels and diphthongs not at all. The potential value of such a simple test warrants prospective evaluation of this rather striking association. Anticipation, at three years of age, of poor reading achievement might argue for formal reading instruction at an earlier age than presently practiced.

3. Intelligence Quotient.

- a. There is a very strong relationship between I.Q. and scholastic achievement in this study sample. The strength of correlation stems from the increasing percentage of children achieving at or above grade level with increasing I.Q. Although there are very few exceptions, I.Q. below 90 virtually guarantees below grade level performance, average-normal or above average I.Q. does not guarantee grade level performance, and, in fact, the majority in the average-normal category demonstrate below grade level achievement.
- b. There was a mean net change in I.Q., from age four years to age seven years, of -0.96. This was statistically significant due to the very large sample size; functionally, it is inconsequential.

4. Pre-School Testing.

a. Two rather elaborate tests were administered, the I.T.P.A. and Metropolitan, in the pre-school period. As sheer predictive tools, they were roughly equivalent. A poor score on either was almost invariably associated with poor scholastic achievement. A higher score was more likely, but not invariably, to be associated with higher scholastic achievement.

b. The Bender-Gestalt Test.

This test did not prove useful in predicting school achievement. The test may be so difficult that pre-school children cannot be expected to accomplish it. It is a test originally interpreted on the basis of the whole or "Gestalt", a highly subjective process. The method of scoring presented by Koppitz violated the Gestalt-approach, in favor of scoring by attention to detail. Presumably this is a more objective approach, but not useful with this sample.

c. Laterality tests.

Laterality awareness, in this age group, is not a useful predictor; perhaps the test is inappropriate for the pre-school age. Laterality preference does not predict scholastic achievement. Laterality preference is not completely developed in the pre-school age, and this may explain its lack of predic-

tive power, although it is not useful, in the author's experience, with older children.

The hand-extension test of Schilder may be regarded as a function of laterality preference. It was not useful as a predictor of scholastic performance - perhaps because of the age at which it was applied.

d. Orthography and Sequencing.

Writing letters of the alphabet and cardinal numbers, in proper sequence and orthographically correct, is a relatively simple task. The number of letters and numerals so written strongly predicts subsequent scholastic performance.

These very primitive tasks seemingly are as effective in predicting as the more elaborate I.T.P.A. and Metropolitan tests.

5. K-Means Analysis.

a. Prediction of patterns of reading achievement.

This technique was employed to detect and document, in quantitative fashion, the suspected existence of groups of children with different patterns of reading achievement over time.

Two very clear-cut and obvious patterns emerge. One: children reading very poorly in grades one and two continue to read poorly through grade six. Two: children reading well in grades one and two continue to do well.

An intermediate group emerges, distinguished by an initial low level of achievement and a final level of achievement lying between the very poor and very good. This group, in turn, is comprised of component subgroups, the hallmark of each group being the grade in which relative acceleration of progress in reading achievement was first noted.

6. Effect of Other Educational Experiences.

The nature, pattern, extent, and variety of these factors make assessment of their impact difficult for this large sample other than to state the obvious: this group of children performed poorly early on in school and did so throughout the first six grades, regardless of past experiences.

7. Differential Achievement.

Were children with particularly disparate achievement in reading versus arithmetic versus spelling present in numbers of consequence, their existence should have been suspect by visual inspection of the achievement scores of the tables presented herein. They were not found. In particular, a relative deficiency in reading achievement vis-a-vis arithmetic or spelling was not found.

8. Extraneous Influences.

A number of factors over which we had no control influenced the cohort of this study. The most

important one is that a number of children were "lost" to the study for inapparent reasons. Presumably they were mainly economic. There was a disproportionately large percentage of Whites in this group. Application of rather crude criteria suggests that there was no difference, for given race-sex groups, between those lost and those continuing in the study.

9. Summary Statement.

The three-year speech exam and/or certain pre-school tests permit delineation, with reasonable confidence of those who will do very poorly and those who will do relatively well. Reading achievement at end of grades one and two will further confirm these predictions and will disclose an intermediate group whose performance in reading will show acceleration of various later grades. These criteria of selection are not necessarily applicable to other than this cohort, characterized by relatively low I.Q. and S.E.S. These criteria do permit detection, reasonably well, of the large fraction of this cohort which will do poorly; those destined for relatively better performance are less accurately defined.

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SOCIOECONOMIC STATUS AND HOME ENVIRONMENT

The Oregon Reading Study included socioeconomic and home environment variables in its inventory. A basic rationale for the socioeconomic information was descriptive; in addition, it was planned to use both sets of data in analysis.

DESCRIPTIVE MATERIALS

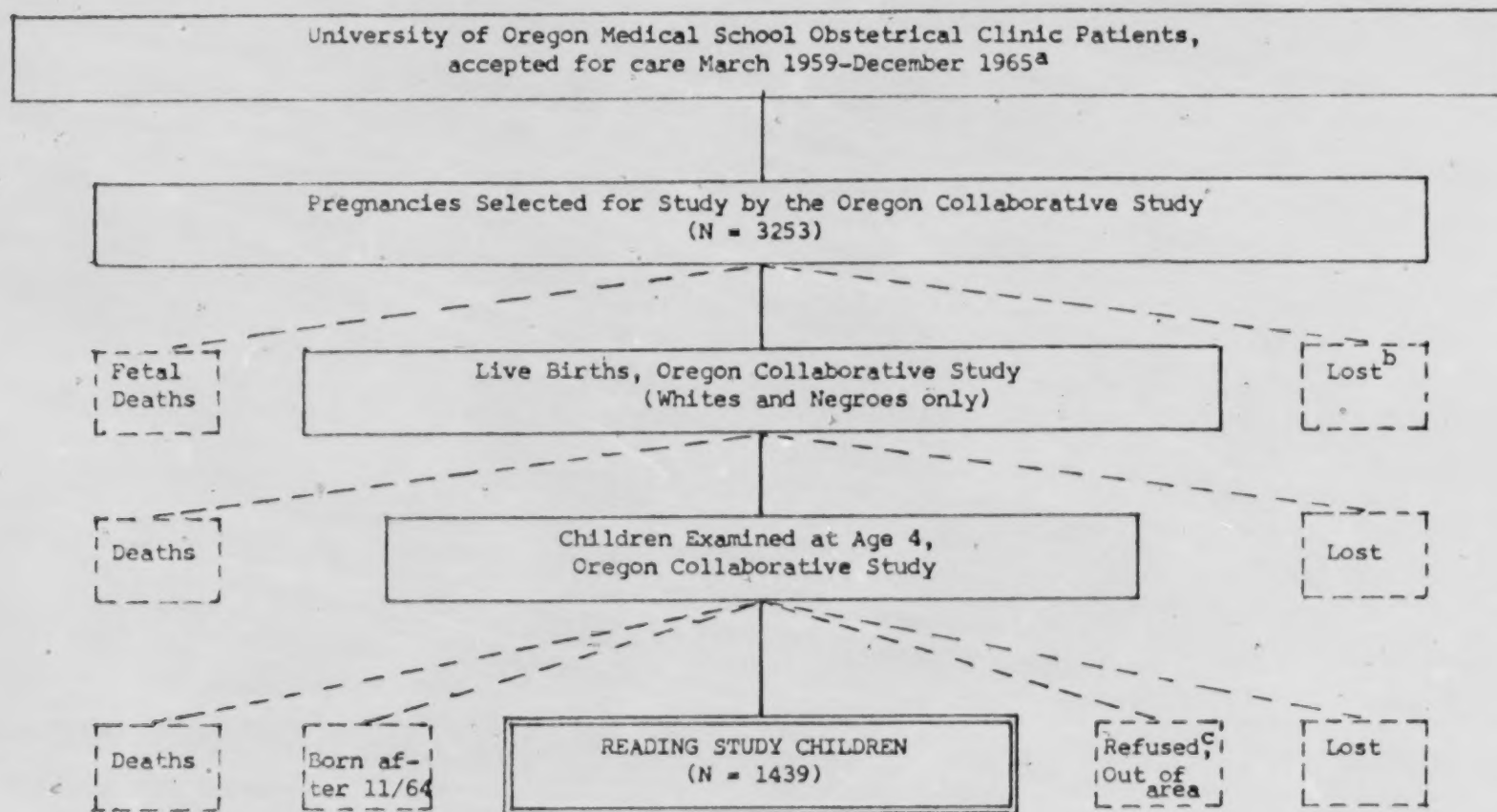
1. Sources of socioeconomic data.

The principal sources of socioeconomic data were interviews conducted by the Oregon Collaborative Study, a national, prospective, long-term study of disorders of the central nervous system in children, conducted under the auspices of the National Institute of Neurological Diseases and Stroke; a Collaborative Study site functioned at the University of Oregon Health Sciences Center between 1958 and 1974. The Reading Study population was drawn from the Oregon Collaborative Study population. Socioeconomic data, as well as medical and psychological data, were made available by the Collaborative Study on those children selected for the Reading Study. These data consisted of the results of two interviews, one conducted with the mother during her pregnancy, a second near the time of the study child's seventh birthday.

2. Relationship to Collaborative Study population.

Approximately 1500 children are subjects of the Reading Study; they are a segment of a sample of over 3200 pregnancies

selected by the Oregon Collaborative Study from maternity patients attending the University of Oregon Health Sciences Center obstetrical clinic from 1959 through 1965. From the outcomes of these pregnancies, the Reading Study chose for study those children living within the Portland metropolitan area at age five who had been born between March 1, 1959 and November 15, 1964. The structural relationship of the Reading Study population to the Oregon Collaborative Study population is shown in the following chart.



Notes: Figures were not available for all categories shown here. (most OCS tabulations exclude Study siblings).

- a. Women living outside the Portland Metropolitan area (somewhat more broadly defined than the Reading Study area) and wives of UOMS residents and students were excluded by OCS.
- b. For various reasons, principally geographical mobility, there was loss in follow-up at all stages of both studies.
- c. Some families living within the Reading Study area refused to participate.

The Oregon Collaborative Study population was a sample of the obstetrical clinic population between 1959 and 1965, reproducing the clinic population in terms of such socioeconomic parameters as maternal age, race, and economic status. Since it was drawn from a clinic serving a medically indigent population, it was not representative of the population in Portland. Nor was it designed to be representative of medically indigent persons in Portland, since it was limited to women of child-bearing age. Moreover, other facilities for low-cost medical care have existed in Portland, and no comparative information was available concerning the users of such alternatives.

The Reading Study population is not perfectly representative of the Collaborative Study population from which it was drawn. Some differences arise from the elimination of fetal and infant deaths, and (probably) from the elimination of children born between November 1964 and November 1965, although the latter are no doubt trivial. If comparisons are limited to Collaborative Study children who lived long enough to be candidates for the Reading Study, the most important differences arise from the elimination of children living outside the Portland metropolitan area: the Reading Study has a somewhat higher proportion of Blacks, these being the families who were least able or least inclined to move away from the city. Comparative percentages of Whites and Blacks are shown in Table 1.

TABLE 1

COMPARISON OF COLLABORATIVE STUDY & READING STUDY POPULATIONS

1. Oregon Collaborative Study registrations, 1959-1965*
(N=3253)

Whites	70.5%
Blacks	27.2%
All other	2.2%

2. Oregon Collaborative Study children tested at age 4 years,
Study siblings excluded, Whites and Blacks only
(N=1796)

Whites	73.1%
Blacks	26.9%

3. Reading Study children, study siblings excluded,**
Whites and Blacks only
(N=1150)

Whites	67.0%
Blacks	33.0%

4. Reading Study siblings

(N=289)

Whites	54.0%
Blacks	46.0%

5. All Reading Study children

(N=1439)

Whites	64.0%
Blacks	35.6%

*Figures for the Oregon Collaborative Study were taken from materials prepared for the use of the Four-Year Task Force, Perinatal Research Branch, NINDS, NIH. Except for initial registration figures, data were compiled by PRB only for the first pregnancy of a woman registered on the study and for Whites and Blacks only. If a first pregnancy resulted in a multiple birth, all outcomes were included.

**First study children are separated from their younger study siblings here for purposes of comparison with Collaborative Study data. For other analyses, the two groups are combined. 32 children in the Reading Study were not classified as either White or Black. These children have been excluded from all data analyses.

3. Effects of including siblings in the Reading Study.

Not only is the proportion of Black children higher in the Reading Study than in the 4-year-old Collaborative Study group, but the differences are accentuated when siblings are included: Blacks have a larger number of siblings in the sample than do Whites. It was those families - both Black and White - with low socioeconomic scores who were most likely to return to the obstetrical clinic during subsequent pregnancies, although any woman once registered on the Collaborative Study had the option of returning to the clinic for free care in later pregnancies, regardless of her financial circumstances. Presumably parameters associated with race and poverty are associated with differences in the proportions of Blacks and Whites in the group being studied and vary with the inclusion or exclusion of siblings. One such parameter, for example, is the mean socioeconomic index score.

TABLE 2

MEAN SOCIOECONOMIC SCORES*

Oregon Collaborative Study Population & Reading Study Population

	<u>Whites</u>	<u>Blacks</u>	<u>Total</u>
Collaborative Study, registration sample, all pregnancies	41	36	40
Collaborative Study, 4-year-old children, first study pregnancies only	42	36	41
Reading Study, all children	35	32	33
Reading Study, first study children only	35	33	35
Reading Study, siblings only	34	30	32

*Socioeconomic scores for each family are a simple average of scores for 1.) education of head of household, 2.) occupation of head of household, and 3.) total family income. See: U.S. Bureau of the Census. Methodology and Scores of Socioeconomic Status. Working Paper No. 15. Washington, D.C., 1963; Ntinou C. Myriantopoulos and Kathrine S. French. An Application of the U.S. Bureau of the Census Socioeconomic Index to a Large, Diversified Patient Population. Social Science and Medicine 2:283-299, 1968. Census Bureau scoring was done on the basis of a 100 point scale; the Collaborative Study collapsed this into a 10-point scale. Reading Study scores are presented in terms of a range of 0-99.

The mean scores presented above are based on scores for all Reading Study families for whom information on any two of the three items used to compute the scores was available; Collaborative Study scores were arrived at in this way. While more families can be included in the analysis when any two scores can be used, some distortion occurs. Therefore, for all subsequent analyses of Reading Study data involving socioeconomic scores, only those families were included for which information on all three component items was available. For this reason, the means shown here and in Tables 4 and 5 differ considerably.

The inclusion of siblings in the Reading Study population affects the distribution of socioeconomic scores, as shown in Table 3. The pattern is similar for Blacks and for Whites, although a different segment of the range is involved: White siblings show a higher frequency in the 40-49 decile and a parallel lower frequency in the 50-59 decile. Black siblings show a higher frequency in the 30-39 decile and a corresponding lower frequency in the 40-49 decile. Other differences in related socioeconomic characteristics can be seen in Table 4. Again, the patterns are similar for Blacks and for Whites, but there are also some noticeable differences between the two groups. The most prominent is the size of the difference in number of fathers reported as heads of households and primary sources of income; the direction of change (to more fathers in the households and providing income) is the same for Whites and for Blacks, but the increase is larger for White families. In addition, the increase in steady incomes reported for siblings is greater for Whites than for Blacks.

TABLE 3
PRENATAL SOCIOECONOMIC DATA BY PREGNANCY AND RACE

Whites: N=927
 Column A - 1st study pregnancies, N=771 (83.2%)
 Column B - study siblings, N=156 (16.8%)

Blacks: N=512
 Column C - 1st study pregnancies, N=379 (74.0%)
 Column D - study siblings, N=133 (26.0%)

PERCENTAGES

	A	B	C	D
	(100.0)	(100.0)	(100.0)	(100.0)
1. Socioeconomic index scores				
0- 9	2.6	2.6	5.3	7.5
10-19	12.7	16.0	11.9	13.5
20-29	21.9	19.9	23.5	18.8
30-39	23.2	21.1	26.4	38.4
40-49	18.0	24.4	21.1	12.0
50-59	12.1	7.0	6.3	6.0
60 and over	6.6	3.9	4.2	0.0
Unknown	2.9	5.1	1.3	3.8
2. Head of household (i.e., person on whom socioeconomic score computed)	(100.0)	(100.0)	(100.0)	(100.0)
Mother	34.8	25.0	53.3	49.6
Father*	62.4	69.9	45.4	46.6
Unknown	2.8	5.1	1.3	3.8
3. Principal source of income	(100.0)	(100.0)	(100.0)	(100.0)
Mother earned	17.6	3.8	17.7	11.3
Father earned	51.5	62.8	35.9	41.3
Relatives or friends	9.0	1.9	12.4	4.5
Welfare	11.5	19.9	28.0	36.1
All other; unknown	10.4	11.6	6.0	6.8
4. Regularity of income	(100.0)	(100.0)	(100.0)	(100.0)
Steady	41.9	51.9	52.8	54.1
Irregular	53.8	42.3	44.6	40.6
Unknown	4.3	5.8	2.6	5.3

*Here and elsewhere in this section, "father" refers to the child's sociological father, i.e., the mother's husband.

Differences between first study children and their siblings reflect changes over time in the group of families involved, changes which are, for the most part, replicated in the differences between the economic circumstances of families reported in the prenatal interviews and those reported in the seven-year interviews. These differences will be documented later.

4. Prenatal socioeconomic characteristics.

Certain basic social and economic characteristics of study families, based on data obtained during the period in which the study child's mother was receiving prenatal care, are displayed in Table 4. (In this table, and elsewhere, unless otherwise specified, a child is the unit of study: one set of data on each sibling is included. Each of these sets, for a group of siblings, describes the same family, but at different points in time.)

TABLE 4
PRENATAL SOCIAL AND ECONOMIC CHARACTERISTICS
OF FAMILIES OF STUDY CHILDREN

	White %	Black %	Total %
1. Background of mother			
a. Birth place	(100.0)	(100.0)	(100.0)
Urban	66.7	59.8	64.2
Rural, non-farm	21.1	26.5	23.1
Rural, farm	7.8	10.5	8.8
All other	4.4	3.2	3.9
b. Religious preference	(100.0)	(100.0)	(100.0)
Catholic	19.2	3.5	13.6
Protestant	69.3	92.2	77.4
All other	11.5	4.3	9.0
2. Education of parents (highest grade completed)			
a. Mother	(100.0)	(100.0)	(100.0)
Grade 0-6	1.9	2.7	2.2
7-9	22.7	20.1	21.8
10-11	38.0	40.8	39.0
High school graduate	29.9	29.1	29.6
Some college, or above	4.3	5.3	4.6
Unknown	3.2	2.0	2.8
b. Father	(100.0)	(100.0)	(100.0)
Grade 0-6	2.6	3.7	3.0
7-9	17.0	7.0	13.5
10-11	19.0	14.8	17.5
High school graduate	20.5	17.0	19.2
Some college, or above	4.6	3.1	4.1
Unknown, no father	36.2	54.3	42.7
3. Social situation of mother			
a. Marital status	(100.0)	(100.0)	(100.0)
Single	7.9	27.9	15.0
Married	66.2	47.3	59.5
Sep., Wid., Div.	25.9	24.8	25.5

TABLE 4 (cont.)

	Whites %	Blacks %	Total %
b. Male partner in household	(100.0)	(100.0)	(100.0)
Husband	66.6	48.0	60.0
Father of baby (not husband)	9.3	14.5	11.1
Neither	24.1	37.5	28.9
c. Type of housing	(100.0)	(100.0)	(100.0)
Single family house	67.8	67.2	67.6
Apartment	26.5	30.2	28.0
All other	5.7	2.1	4.4
4. Economic circumstances			
a. Mother's occupation	(100.0)	(100.0)	(100.0)
Professionals, proprietors, managers, craftsmen	1.1	0.2	0.8
Clerical	14.7	3.7	10.8
Sales	5.5	1.0	3.9
Operatives	17.0	10.9	14.9
Domestic service	7.6	17.8	11.2
Other service	28.9	36.1	31.5
Unskilled labor	2.5	3.1	2.7
No occupation	19.0	24.8	21.0
Unknown	3.7	2.3	3.2
b. Mother's employment status	(100.0)	(100.0)	(100.0)
Never employed	18.3	23.6	20.2
Not working at time of interview	73.7	68.4	71.8
Employed	4.2	5.1	4.5
All other			
c. Father's occupation	(100.0)	(100.0)	(100.0)
Professionals, proprietors, managers	1.9	0.2	1.3
Clerical	2.6	2.3	2.5
Sales	2.6	0.8	2.0
Craftsmen	11.3	4.5	8.9
Operatives	19.0	6.4	14.5
Service	17.2	15.8	9.7
Unskilled labor	17.2	15.6	16.6
None; no father	33.8	51.4	40.0
Unknown	5.3	2.9	4.4

TABLE 4 (cont.)

	Whites %	Blacks %	Total %
d. Primary source of family income	(100.0)	(100.0)	(100.0)
Mother earned	15.3	16.0	15.6
Father earned	53.4	37.3	47.7
Welfare	12.9	30.1	19.0
Relatives, friends	7.8	10.3	8.7
All other	10.6	6.3	9.0
e. Regularity of income	(100.0)	(100.0)	(100.0)
Steady	43.6	53.1	47.0
Irregular	51.9	43.6	48.9
Unknown	4.5	3.3	4.1
f. Socioeconomic index scores	N = 833	N = 472	N = 1305
0- 9	(100.0)	(100.0)	(100.0)
10-19	1.0	3.0	1.7
20-29	7.9	9.5	8.5
30-39	16.7	19.3	17.6
40-49	22.3	32.0	25.8
50-59	23.4	23.7	23.5
60-69	15.6	6.8	12.4
70-79	8.6	4.0	7.0
80-89	4.0	1.5	3.1
90-99	0.5	0.2	0.4
	0.0	0.0	0.0
$\bar{X}$	41	35	39

5. 7-year socioeconomic characteristics.

Table 5 presents some comparable data relating to the family situation of study children at age 7. Only those data used in further comparisons and analyses are included.

TABLE 5
7-YEAR SOCIAL AND ECONOMIC CHARACTERISTICS
OF FAMILIES OF STUDY CHILDREN

	Whites %	Blacks %	Total %
1. Education of parents (highest grade completed)			
a. Mother	(100.0)	(100.0)	(100.0)
Grade 0-6	1.9	2.7	2.2
7-9	16.5	15.8	16.3
10-11	31.7	28.9	30.7
High School graduate	34.5	31.1	33.3
Some college, or above	5.6	6.6	6.0
Unknown	9.7	14.8	11.5
b. Father	(100.0)	(100.0)	(100.0)
Grade 0-6	2.2	2.5	2.3
7-9	13.2	7.2	11.0
10-11	14.1	9.8	12.6
High school graduate	22.4	14.1	19.5
Some college, or above	7.4	4.9	6.5
Unknown	40.7	61.5	48.1
2. Economic circumstances	(100.0)	(100.0)	(100.0)
a. Mother's occupation			
Professionals, propri- etors, managers, craftsmen	1.4	1.0	1.3
Clerical	11.0	7.8	9.9
Sales	2.6	0.8	1.9
Operatives	15.7	13.5	14.9
Domestic service	1.0	7.8	3.4
Other service	26.6	32.6	28.8
Unskilled labor	1.6	2.3	1.9
None	30.9	18.3	26.4
Unknown	9.2	15.8	11.5
b. Father's occupation	(100.0)	(100.0)	(100.0)
Professionals, propri- etors, managers	4.2	0.0	2.7
Clerical	2.7	1.4	2.2
Sales	2.0	0.8	1.6
Operatives	21.0	10.9	17.4
Service	4.5	6.8	5.4

TABLE 5 (cont.)

	Whites %	Blacks %	Total %
b. Father's occupation (cont.)			
Unskilled labor	7.7	8.2	7.9
None; no father	34.2	48.6	39.3
Unknown	10.8	17.0	13.0
c. Socioeconomic index scores	N = 812 (100.0)	N = 431 (100.0)	N = 1243 (100.0)
0- 9	0.0	0.7	0.3
10-19	2.8	2.3	2.7
20-29	5.7	11.8	7.8
30-39	13.3	22.1	16.3
40-49	18.5	18.3	18.4
50-59	20.2	16.5	18.9
60-69	16.7	15.6	16.3
70-79	15.8	10.4	13.9
80-89	6.0	2.3	4.7
90-99	1.0	0.0	0.7
$\bar{X}$	54	48	52

6. Comparisons between prenatal and 7-year data.

6.1 The category "unknown" increased for all items. This was apparent in comparing first study children with siblings, and it is even more pronounced between prenatal and 7-year data. Not all the reasons for this are known; loss of contact was not a major factor, since Reading Study children were selected from Collaborative Study families who had been maintained until the children were six years of age. One reason was certainly increased resistance on the part of parents to be interviewed. Furthermore, prenatal interviews were obtained without too much difficulty while the mothers were attending the clinic, but the mothers of 7-year-olds were less accessible to interviewers. It was not the policy of the Collaborative Study to jeopardize medical follow-up by insistence on the socioeconomic interview, and many mothers declined or evaded the interview.

6.2 Educational levels of mothers rose among both Whites and Blacks. More White girls completed high school than did Blacks, and the percentage which obtained at least one year of college increased by about the same amount for both groups.

6.3 Educational levels of fathers were also higher in the 7-year data. However, since these are sociological fathers and a good many shifts in marriage partners had taken place, the difference between prenatal and 7-year figures represents a combination of two processes: 1.) the acquisition of additional years of schooling (not infrequently in the armed forces) by some young fathers, and 2.) the selection of men with somewhat more education as husbands by women who married or remarried between the two interviews. These two processes have not been separated in our analysis of the data.

6.4 In the tables, occupational categories are listed in rank order according to the relative scores which they receive in computing the socioeconomic index. For Whites, all categories declined in percentage, with the exception of an insignificant change in the small category of professionals, managers, proprietors, and craftsmen, and in the group for whom no occupation is reported. The most significant shift for both White and Black women was from employed to not employed, and this shift was noticeably greater among Whites. Black women had somewhat better occupations at the time of the 7-year interviews: the number of service workers declined and the number of operatives and clerical workers increased.

6.5 Occupations of fathers in White families were somewhat higher in 7-year interviews: the number of professionals, proprietors, and managers increased, as did the percentage of craftsmen and operatives, while the number of service workers and particularly of unskilled laborers declined. Again, the persons whose occupations are reported in the 7-year interview are not necessarily the same persons reported upon in the prenatal interview. For Blacks, the pattern is similar, except for there being almost no men in the professional, proprietors, and manager category at any time.

6.6 Differences between Whites and Blacks in two of the three components of the socioeconomic index scores, income and occupation, were significant both for the prenatal period

and at 7 years. Educational differences were not significant at the time of mother's registration but had become so by the time the child was 7 years old. These data are presented in Table 6.

TABLE 6

DIFFERENCES BETWEEN WHITES AND BLACKS IN FAMILY INCOME,
AND OCCUPATION AND EDUCATION OF HEAD OF HOUSEHOLD, PRENATALLY
AND AT 7 YEARS

	Whites	Blacks
1. Income		
a. prenatal		
under \$3000	424	313
\$3000 or more	409	159
$\chi^2 = 29.1178, P < .001$		
b. 7 years		
under \$5000	369	259
\$5000 or more	461	172
$\chi^2 = 27.7390, P < .001$		
2. Occupation		
a. prenatal		
Service occupations		
and below	368	315
Domestics and above	465	157
$\chi^2 = 61.4668, P < .001$		
b. 7 years		
Service occupations		
and below	365	255
Domestics and above	465	176
$\chi^2 = 26.1854, P < .001$		
3. Education		
a. prenatal		
11th grade or less	523	294
12th grade or more	310	178
$\chi^2 = .0316, .90 \quad P < .05$		
b. 7 years		
11th grade or less	411	241
12th grade or more	419	190
$\chi^2 = 4.6508, P < .05$		

6.7 Although both Whites and Blacks made gains in income levels during the period with which the Reading Study was concerned, the question arises as to how much, if any, of the increase in income represented an increase in purchasing power. It has been possible to make only rough estimates. However, if the Consumer Price Index is used as a measure of inflation, it appears that both Blacks and Whites made real gains, although the Blacks gained somewhat less than the population of the United States as a whole. (Table 7.)

TABLE 7

PERCENTAGE GAINS 1959-1971 : CONSUMER PRICE INDEX
 COMPARED TO AVERAGE FAMILY INCOME FOR THE UNITED STATES
 AND FOR THE READING STUDY POPULATION

	CPI* (1963=100.0)	U.S.* average	Reading Study Average Whites	Blacks
1959	95.1	\$5,417	\$2,512	\$2,520
1971	132.3	\$10,285	\$5,643	\$4,630
Rise	37%	90%	113%	84%

*Consumer Population Reports, Consumer Income, Series P-60,
 Nos. 35, 81, 86. U.S. Department of Commerce.

7. Changes in socioeconomic scores and related variables.

7.1 Socioeconomic scores. Changes which occurred in the socioeconomic scores of those families for which measures were available from both the prenatal interview and the 7-year interview were examined. Although the average scores rose, there were families whose scores were unchanged or declined and families whose score rose far more than the average. Average scores for Blacks and Whites advanced by the same amount but the advance occurred at different regions of the scale and proportionally more Blacks showed no gain (Table 8).

TABLE 8
CHANGES IN FAMILY SOCIOECONOMIC SCORES
FROM CHILD'S AGE 0 to AGE 7

	Whites No. (%)	Blacks No. (%)
No change or SE score declined	80 (11.1)	106 (27.1)
SE score up 1-21 points	273 (37.7)	120 (30.6)
SE score up 22 points or more	371 (51.2)	166 (42.3)

$\chi^2 = 46.84, P < .001$

(Population means: Age 0	41	35
Age 7	54	48
Difference	13	13)

7.2 Age of head of household. Changes in family socioeconomic scores indicate real socioeconomic differences between the two points in time represented by the interviews. Such differences may be directly related to other demographic characteristics, for example the age of the head of the household at the time of the first interview. For those Reading Study families whose family head was very young at the time of the prenatal interview, levels of occupation, income, and in some cases education, might be expected to rise relatively more in the succeeding seven years than would those of family heads who were in their thirties and forties when the study began.

Satisfactory information on age of father was not available from the 7-year interviews, so age of head of household could not be correlated with socioeconomic score. However, socioeconomic scores showed significant associations with age of mother, except for Whites at registration (Table 9).

TABLE 9
SOCIOECONOMIC SCORES AND AGE OF MOTHER AT REGISTRATION
AND 7-YEAR INTERVIEW (ANALYSIS OF VARIANCE)

	AGE GROUPS					
	19	20-24	25-29	30-34	35	F
<u>Whites</u>						
Mean SES at regis. (N=897)	33 (211)	34 (357)	36 (172)	33 (97)	32 (60)	1.2474
Mean SES at 7 years (N=764)	59 (184)	57 (300)	57 (136)	52 (87)	46 (57)	8.8754
<u>Blacks</u>						
Mean SES at regis. (N=502)	28 (152)	35 (158)	31 (104)	27 (51)	28 (37)	7.1027
Mean SES at 7 years (N=400)	52 (122)	57 (127)	51 (78)	48 (41)	47 (32)	4.1870

7.3 Sex of head of household. Analogous to relationships between age and socioeconomic score are relationship between the sex of head of household and family score. Occupational and income levels for women might be presumed to be sufficiently below those for men to depress the socioeconomic score for those families headed by women.

In comparing socioeconomic score of male and female household heads, differences between Whites and Blacks emerged. Among Whites, the sex of the head of household was not significantly related to socioeconomic score; among Blacks, both at the prenatal and at the 7-year interview, the relationship was significant and was sufficiently strong to influence figures for the total population (Table 10).

TABLE 10
SOCIOECONOMIC SCORES AND SEX OF HEAD OF HOUSEHOLD
AT REGISTRATION AND 7-YEAR INTERVIEW
(ANALYSIS OF VARIANCE)

	Male	Female	F
<u>Whites</u>			
Mean SES at regis. (N=897)	34 (590)	33 (307)	0.7324
Mean SES at 7 years (N=764)	56 (535)	55 (229)	0.6121
<u>Blacks</u>			
Mean SES at regis. (N=502)	32 (234)	30 (268)	5.5187
Mean SES at 7 years (N=400)	54 (191)	51 (209)	2.1250

For both Blacks and Whites the sex of the head of household was significantly related to the amount of change in the family socioeconomic score between the prenatal and registration interview (Table 11). The least change in score was exhibited by White families headed by a woman at both interviews, the most change by White families headed by a man (not necessarily the same man) at both interviews.

When changes in the sex of the household head were considered in relation to 7-year socioeconomic scores, differences between Whites and Blacks were significant in those cases in which there had been no change in sex and in those cases in which the sex had changed from male to female. Where the sex changed from female to male, the difference was not significant, both Whites and Blacks showing more families with socioeconomic scores above the population median (Table 12).

TABLE 11
CHANGE IN SOCIOECONOMIC SCORES IN 7-YEAR INTERVAL
BY SEX OF HEAD OF HOUSEHOLD
(ANALYSIS OF VARIANCE)

	Male Head (both interviews)	Female Head	F
<u>Whites</u>			
Mean difference in SES (N=440)	14 (362)	3 (78)	25.5746
<u>Blacks</u>			
Mean difference in SES (N=247)	15 (120)	10 (127)	7.4272

TABLE 12
7-YEAR SOCIOECONOMIC SCORE BY RACE AND CHANGE
IN SEX OF HEAD OF HOUSEHOLD

		<u>Whites</u>	<u>Blacks</u>	<u>X²</u>	<u>P</u>
Head of Household:					
1.)	No change				
	SES at median				
	or below	223	151		
	SES above				
	median	253	115	6.72	<.01
2.)	Male to female				
	SES at median				
	or below	64	47		
	SES above				
	median	65	22	6.25	<.02
3.)	Female to male				
	SES at median				
	or below	51	27		
	SES above				
	median	80	32	0.78	not. sig.

7.4 Marital status. Another way to detect the influence of the sex of the household head on socioeconomic score is through the marital status of study mothers. Many changes in marital status occurred among the mothers of Reading Study children during the 7-year period involved. For the purposes of Table 13, only marital status at the time of the two interviews is considered. Those women who were married at the time of the 7-year interview showed considerably greater increases in socioeconomic scores, regardless of their prior marital status, than those who were unmarried at the 7-year point. The differences were significant for both Blacks and Whites.

TABLE 13
CHANGE IN SOCIOECONOMIC SCORES IN 7-YEAR INTERVAL
BY MARITAL STATUS OF MOTHER
(Analysis of Variance)

	Prenatal: 7 year:	Married Mar. Not	Not Married Mar. Not	F
<u>Whites</u>				
Mean dif. in SES (N=729)	14 (358)	5 (156)	22 (115) 7 (100)	23.1642
<u>Blacks</u>				
Mean dif. (N=391)	15 (123)	5 (71)	19 (55) 10 (142)	10.1671

8. Home environment data.

8.1 The interview. To supplement the social data available from Collaborative Study records (on parental education, marital status, etc), an interview was developed in an attempt to explore some features of home environment and maternal attitudes. This interview was held with the child's mother when the child was first tested for the Reading Study, i.e., when the child was about five years of age, or as soon thereafter as possible.

The interview was pretested in the year preceding initial selection of Reading Study subjects. For open-ended questions, requiring prose responses, categories for scoring answers were developed on the basis of the first approximately 100 interviews completed. Provisional categories were defined by a research assistant (an advanced medical student). Two other members of the Reading Study staff then independently applied these categories to the same set of interviews. The results were compared and discussed, and some modifications were made. The revised scoring system was then applied independently by the three staff members to a new set of interviews. Results were again compared and discussed. All interviews were re-scored in terms of the final version of the instructions. Thereafter, all interviews were scored independently by two persons and any differences resolved by discussion among the staff.

8.2 Abridged interviews. A shortened version of the family interview was used in cases in which a complete interview had been done for an older sibling within three years (82 Whites, 74 Blacks), on one of twins or two of triplets (4 Whites, 3 Blacks), and in cases in which the respondent was not the child's mother and could not sensibly be asked certain questions (6 Whites, 3 Blacks). Abridged interviews included only those questions pertaining to the child itself. When the reason for the shortened interview was an earlier complete interview, information from the earlier interview which pertained to the mother herself or to the child's family was used for both records.

A significantly higher proportion of abridged interviews were done with Black respondents than with Whites, attributable primarily to the relatively larger number of Black siblings in the study.

TABLE 14

Distribution of complete and abridged interviews.

	Whites	Blacks
Interview complete	644 (87.5%)	311 (79.5%)
Interview abridged	92 (12.5%)	80 (20.5%)

$$DF = 1, X^2 = 12.5115, P < .001$$

There were no significant differences between complete and abridged interviews according to the sex of the child.

8.3 Relationship of respondent to child. In 93% of the interviews, the respondent was the child's mother. There were no significant differences between Blacks and Whites nor between boys and girls in this respect.

8.4 Place of interview. In order of preference, interviews were conducted at the school (at the same time the child was tested), in the home, or at the study facility. Time did not permit interviewing all mothers during the period their children were tested, and not all mothers accompanied their children to the school. Home appointments were arranged for most of those not interviewed at the school; in a few instances, mothers came to the Medical Center for the interview. More Black mothers than Whites were interviewed at the time the child was tested, but the differences, though significant ($DF = 2$, $\chi^2 = 8.3147$, $P < .02$), were not large.

8.5 Interviewers. Two interviewers were employed during the study, one for a relatively short period at the beginning who did slightly over 10% of the interviews. A second interviewer did the remaining 90% of the interviewing. There were no significant differences between them in the proportions of interviews conducted with Whites and Blacks or mothers of boys and girls.

8.6 Failed interviews. Attempts were made to interview the mother of every child tested at five years of age, or, failing the mother, a person who was responsible for a considerable amount of the care of the child. These attempts were not successful for 21% of White children and 24% of Black children (not a statistically significant difference).

8.7 Data lacking on fathers. As was expected from the fact that many families had no male head at the time of one or both of the socioeconomic interviews, there were no fathers present in many households at the time of the Reading Study interview; consequently, questions relating to them were not relevant. 25% of White families and 48% of Black families were in this category, a difference between Whites and Blacks which was statistically significant ($DF = 1$, $\chi^2 = 61.0520$, $P < .001$). There were no significant differences between the families of boys and girls in the population as a whole nor within ethnic groups.

8.8 Unused questions. A few of the questions in the family interview did not produce sufficient variability of responses to be useful in analysis. For example, television proved to be present in almost all homes. With reference to certain attitudes, almost all mothers expressed the belief that even very young children could be given small chores and almost none expressed the opinion that outside influences of peers and school were more important than parental influences on young children. Such questions were eliminated from analysis.

In a few instances, data obtained could not be used because the method of scoring the interview or of coding it for computer storage inadvertently resulted in obliterating potentially useful distinctions. For example, certain information on the presence and kinds of reading material in the home was not available for these reasons. These questions might eventually have been recoded and the information retrieved, but time did not permit this.

9. Other instruments.

9.1 Activity rating. A list of various activities, including reading, was presented to each mother and she was asked to indicate whether she felt the activity to be primarily masculine or primarily feminine. The use of this technique was stimulated by Mazurkiewicz' report of his investigations into "Social-Cultural Influences and Reading" (Journal of Developmental Reading 3:4 254-263, 1960), and the list used was based on his. Responses to four items, "reading," "writing," "studying," and "mathematics" were tabulated.

9.2 Reading ability. Mothers of study children were given a short word recognition test in an attempt to obtain some evidence as to their reading ability to supplement information on the amount of formal education received. The test used was Level 2 (Reading) of the Wide Range Achievement Test (1965) by Jastak, Bijou, and Jastak. Scores were translated into grade norms according to the equivalence table on the test form.

10. Home environment data.

Many of the questions asked in the Family Interview produced responses with reasonable amounts of variability. Some did not. For example, television was present in over 97% of the homes; it is thus not useful as an independent variable in investigating reading performance in this population of children. In some cases, coding and data storage were done in such a way that potentially interesting differences were obscured, and the intent of the interview question was subverted. Time did not permit the reworking of such data.

In addition to variability within the population as a whole, some sets of responses showed significant differences between Whites and Blacks and/or between the mothers of boys and of girls.

The listing which follows summarizes the data obtained by the family interview. Only those variables are included which showed an appreciable range, i.e., not more than two-thirds of the responses fell into a single category. There are a few exceptions for items of particular interest. Variables for which the coding was inadequate (as described above) are excluded.

Variables are identified by data bank number and by a short title. The wording of the questions, pre-coded responses where used, and interviewing, coding, and data storage instructions are supplied in appendices to this report.

When significant differences (by Chi-square tests, $P \leq .05$) between Whites and Blacks or between boys and girls were found, they are described briefly and the level of significance is given.

The total number of responses varies somewhat from one question to another. In addition to the fact that not all mothers were interviewed, not all of those interviewed answered every question. For most questions N falls between 1000 and 1150. In cases in which the N fell below 1000 (as, for example, in questions concerning the respondent's husband), the N for that question is given.

10.1 Disagreement between respondent and husband concerning child rearing practices. Variables 221, 222; N = 728.

More Whites than Blacks reported disagreement ($P < .001$), gave more specific reasons for it ($P < .05$), and were more likely to describe their disagreement as moderate (rather than either mild or strong). Problems involving discipline were the sources of disagreement most commonly mentioned by both Whites and Blacks.

10.2 Differences between child's mother and her parents concerning child rearing practices. Variable 223.

More Blacks than Whites reported dissimilarities ($P < .05$), and the two groups differed in the reasons given ($P < .001$): Blacks mentioned "changing times", and they

reported that their parents were more strict, or too strict; Whites more often mentioned family size and composition, and they reported that their parents were less strict, or not strict enough.

10.3 Differences between child's mother and her peers concerning child rearing practices. Variable 224.

Variability did not correlate with ethnic group or sex of child.

10.4 Parent-child contact at meals. Variables 226, 227.

At both breakfast and supper, Black children were more likely to eat by themselves or with other children - i.e., without an adult - than were White children ($P < .001$, $P < .001$).

10.5 Age at which responsibilities given to children. Variable 229, $N = 978$, 230, $N = 806$.

White mothers reported giving both self-care and household responsibilities to their children at a somewhat earlier age than did Black mothers ($P < .001$, $P < .02$).

There were no significant correlations between the sex of the child and the age at which they were given tasks.

10.6 Differences in expectations for girls and boys in mental quickness, "smartness." Variable 231, $N = 974$.

A very small proportion of mothers said they expected

boys to be smarter than girls. White women were otherwise about evenly divided between those who expected girls to be smarter and those who said they expected no differences. Among the majority of the Black mothers, about twice as many expected girls to be smarter than boys ($P < .001$).

There were no significant differences between mothers of girls and mothers of boys, either for the population as a whole or within each group.

10.7 Differences in expectations for girls and boys in athletic and physical abilities. Variable 232, N = 962.

More White mothers than Black mothers said they expected no consistent differences in physical maturity between five-year-old boys and girls; fewer White mothers than Blacks expected boys to be more mature. A small proportion (larger among Whites) expected girls to mature faster ($P < .01$).

Mothers of study boys did not show significant differences from mothers of study girls.

10.8 Mother's evaluation of child's ability to recite the alphabet. Variable 238.

More White mothers said the study child had little or no ability to recite the alphabet; more Blacks rated their children as moderately good ($P < .001$).

Girls were more often rated excellent or moderately good by their mothers than were boys ($P < .001$). This was

true for all mothers and for Whites ($P < .01$) and Blacks ($P < .02$) analyzed separately.

10.9 Mother's evaluation of child's ability to count to 20.
Variable 240.

Girls were more likely to be rated excellent than were boys by both White mothers and Black mothers ($P < .001$; for Whites, $P < .01$, for Blacks $P < .02$).

10.10 Mother's evaluation of child's ability to print own name. Variable 241.

Fewer Black mothers rated their children as moderate or excellent in their ability to print ($P < .001$).

More mothers of girls rated them as excellent or good ($P < .001$). When Blacks and Whites were analyzed separately, however, significant differences between boys and girls were found only among White mothers ($P < .001$).

10.11 Skills taught to children. Variable 243.

More White mothers taught their children to identify colors and to print; more Black mothers taught their children to dress themselves ($P < .01$).

There were no differences between boys and girls within the population of Black mothers. White mothers were more likely to teach boys to dress themselves and tie their shoes; they were more likely to teach girls the alphabet,

to identify colors, and to print ($P < .05$).

10.12 Mother's style of teaching. Variable 244.

Black mothers reported using more instructional aids (e.g., flash cards) in teaching skills to their children than did Whites ($P < .01$).

10.13 Number of hours per day child watches T.V. Variable 246.

Among Black children, boys watched somewhat more television than did girls ($P < .02$). The mode for boys was two to three hours, for girls one to two hours.

10.14 Selection of child's T.V. programs. Variable 248.

Selection of the T.V. programs watched by the study child was shared in all households by the child, his siblings, and his parents. However, White parents were more likely to be involved in the selection than were Black parents ($P < .001$).

10.15 Child's preference for looking at books, etc., compared to other specified activities. Variable 250.

There was no significant difference between Blacks and Whites in the ranking of "looking at books, etc." as an activity. The difference between boys and girls was, however, significant within both groups (for Whites, $P < .01$; for Blacks, $P < .001$). For twice as many girls as boys it

was reported as a first or second choice among activities.

10.16 Child's preference for drawing, coloring, etc., compared to other specified activities. Variable 251.

Boys and girls showed a significant difference in the frequency with which they were reported to show a first preference for drawing, coloring, etc. (for both Blacks and Whites, $P < .001$). For 62% of girls and 43% of boys it was reported as a first or second choice among activities.

10.17 Presence of newspapers in the home. Variable 252.

56% of the respondents said they got a newspaper every day, 14% got a paper two or three times a week, 21% once a week, and 9% said they never got newspapers. There were no differences between Whites and Blacks.

10.18 Presence of magazines in the home. Variable 253.

Adult magazines were more common than children's magazines in both White and Black households. However, Whites reported more children's magazines than did Blacks, and more Whites had no magazines at all than Blacks ($P < .001$).

10.19 Mother's enjoyment of reading. Variable 257.

There were no significant differences between Blacks and Whites nor between the mothers of boys and girls. 12% of all mothers said they did not enjoy reading, 50% said they like to read very much, and 38% gave intermediate responses.

10.20 Father's enjoyment of reading. Variable 258, N = 745.

There were no significant differences between Whites and Blacks, nor between the fathers of boys and girls. 26% of fathers were described as not liking to read, 44% to enjoy reading very much, and 30% to be intermediate.

10.21 Material read by mother on child rearing. Variable 259.

61% of White mothers and 53% of Black mothers said that they had read something on child-rearing within two years; the difference is statistically significant ($P < .05$).

10.22 Person reading most to child. Variable 261, N = 744.

Black children were more likely to be read to by older siblings, other relatives, baby sitters, etc., than were White children ($P < .05$).

10.23 Frequency of reading to child. Variable 262, N = 725.

Differences between Whites and Blacks and boys and girls were not significant.

10.24 Child's liking for being read to. Variable 263.

Among Whites, girls were said to like being read to more than boys ($P < .01$); among Blacks, girls and boys did not differ, nor was there any significant difference between Blacks and Whites.

10.25 Frequency with which child looks at books, etc.

Variable 264.

White girls were reported to look at books, magazines, pictures, comics, etc., more often than White boys ($P < .001$). There was no significant difference between Black girls and Black boys, nor between Whites and Blacks.

10.26 Mother's history of reading problems. Variable 266.

Slightly less than one third of the mothers reported having had reading problems. There were no significant differences between Whites and Blacks or between the mothers of boys and of girls.

10.27 Father's history of reading problems. Variable 267,

N = 591.

Only about one fourth of the fathers of study children (i.e., sociological fathers in the household at the time of the interview) were reported to have had reading problems. There were no significant differences between Whites and Blacks or between the fathers of boys and of girls.

10.28 Older sibling with reading problems. Variable 268,

N = 836.

Over 800 study children had at least one older sibling. Of these, 62% had an older sibling with some degree of reading difficulty, as reported by the mother. There were no significant differences between Blacks and Whites or between boys and girls.

10.29 Mother's explanation of an older child's poor school performance. Variable 270, N = 456.

After the elimination of mothers with no older children or whose children were doing well, 456 responses were obtained. There were no significant differences between Whites and Blacks. Mothers attributed their children's poor school record to general intellectual slowness (15%), to a specific deficit, e.g., reading (16%), to physical or emotional problems (19%), and to lack of motivation (40%). The remaining 10% of the responses included a few which blamed teachers or schools, plus miscellaneous others.

10.30 Mother's explanation of an older child's good school performance. Variable 272, N = 457.

Mothers with no older children, or with children whom they did not regard as doing well in school were eliminated, leaving 457 responses. The mothers attributed the good performance of their children to intelligence (25%), specific skills, e.g., in arithmetic (10%), a positive attitude on the part of the child (23%), and hard work (17%). The other 25% had no explanation or offered ones which did not fit the above categories. There were no significant differences between Blacks and Whites.

10.31 Amount of education desired for children. Variable 273.

There were no significant differences between Blacks and Whites in the responses to this question. About 30% of all mothers wanted at least a high school education for their

children, and about 50% wanted their children to get a college education. The remaining 20% mentioned various combinations of vocational and academic training.

10.32 Opinions concerning education needs of girls and boys.
Variable 274.

Whites and Blacks differed significantly in their responses, White mothers being more likely to feel that boys and girls should have differing amounts of education; overwhelmingly they felt that boys should have more education than girls. Black mothers were more likely to feel that boys and girls need equal amounts of education ($P < .001$).

10.33 Ways in which parents can help children to get an education. Variable 275.

White mothers were more likely to mention financial help; Black mothers more often mentioned persuading children of the usefulness of an education, helping them with schoolwork, and providing general encouragement ($P < .01$).

11.1 Activity ratings. Variables 234, 235, 236, 237.

Each mother interviewed was asked to indicate whether each of 22 activities seemed to her to be more masculine or more feminine. Responses to four of the 22 were coded and analyzed. For both Whites and Blacks, the pattern is the same for "studying", "writing", and "reading". Studying is the most ambiguous activity, reading the least; all three were generally considered feminine activities, usually by over two-thirds of the mothers. Blacks reported the feminine stereotype even more frequently than did Whites, to the extent that the differences between the two groups were significant.

The identification of mathematics as a masculine activity was less common among Black mothers than among Whites; this difference was also significant.

Relatively few mothers interviewed were undecided.

Table 15

Activities rated as masculine or feminine

		<u>Whites</u>	<u>Blacks</u>	<u>X² Sig. level</u>
Studying:	Masculine	47%	27%	)
	Feminine	51%	70%	) P < .001
	Undecided	2%	3%	)
Writing:	Masculine	28%	19%	)
	Feminine	70%	79%	) P < .01
	Undecided	2%	2%	)
Reading:	Masculine	19%	10%	)
	Feminine	78%	87%	) P < .01
	Undecided	3%	3%	)
Mathematics:	Masculine	81%	69%	)
	Feminine	17%	29%	) P < .001
	Undecided	2%	2%	)

11.2 Jastak reading test.

The results of the Jastak reading test given to study mothers are shown in Table 16 . A standardized conversion table is provided by the authors of the test which converts raw scores to grade levels by grade completed plus months of the next grade. Scores of Reading Study mothers were rounded to the nearest grade. There were no significant differences between the mothers of boys and girls; differences between Blacks and Whites were significant.

TABLE 16

Grade level	Whites %	Blacks %
1-2	1	4
3-4	4	12
5-6	7	20
7-8	33	37
9-10	21	12
11-12	12	7
13-14	10	3
15-16	9	3
17+	3	2
	<u>100%</u>	<u>100%</u>
$\bar{X}$	9.7	

Chi-square groups: grades 1-4, 5-8, 9-12, 13+

Df = 3, $\chi^2 = 94.32$, $P < .001$.

Table 17 compares study mothers' Jastak scores with their formal educational levels. The distribution of the latter is based on 7-year interview data, adjusted to eliminate "unknowns."

Whites show a lack of correspondence at both ends of the scale: almost 60% of the mothers read at 9th grade level or below, while only 20% reported a 9th grade education or less. On the other hand, 22% read at a level above that of a high school graduate, while only 6% had that much formal education. For Blacks, the discrepancy at the lower end of the scale was more pronounced; the percentage of high-scoring readers corresponds very closely to the percentage having more than a high school education.

TABLE 17

	<u>Jastak grade norms</u>		<u>Formal educational level</u>	
	Whites	Blacks	Whites	Blacks
Grade:	%	%	%	%
0-6	12.1	35.9	2.1	3.2
7-9	47.6	44.7	18.3	18.6
10-11	12.3	9.7	35.2	34.0
12	5.9	2.3	38.2	36.5
13+	<u>22.1</u>	<u>7.4</u>	<u>6.2</u>	<u>7.7</u>
	100.0%	100.0%	100.0%	100.0%

RELATIONSHIPS WITH PERFORMANCE VARIABLES

It was not the major purpose of the Reading Study research design simply to compare the reading performance of study children with a large series of single socioeconomic and home environment variables. Rather, it was intended to take into account the implications of socioeconomic and family data and to develop combinations of variables which might be more powerful predictors of reading and school performance than single items taken alone. This process was begun but could not be completed because of the early termination of the study.

The work which was done in beginning a search for diagnostic variables or sets of variables is described in the following pages.

1. Socioeconomic changes from birth to age 7.

One feature of the socioeconomic data is the fact that it is capable of revealing changes in family situations over time. One possibility which was explored was that the population was not homogeneous. The original source of study families was a public clinic with somewhat flexible admissions policies; admission depended primarily on ability to pay at the time of application for care. Thus, women on welfare received their care at the clinic, but so also did students and the wives of students (i.e., high school and college students - not medical students' wives, who were excluded

from the sample), wives of men temporarily out of work, or women whose pregnancy coincided with some other family emergency. Moreover, the age of the population was young; it was possible that the low socioeconomic scores obtained at registration on the study reflected to a significant degree, the point in their life career at which the initial measure was taken (cf. Charles B. Nam and Mary G. Powers, Variations in Socioeconomic Structure by Race, Residence, and the Life Cycle, American Sociological Review 30:1:97-103, 1965).

If it proved to be the case that what was originally an apparently homogeneous groups, as indicated by measures of occupation, education, and income, could be divided into subgroups which, with the passing of time, diverged from each other in these respects, it was proposed to investigate whether the reading performance of the children showed corresponding differences.

It was possible in the time available to test for only a few correspondences between groupings derived from changes in socioeconomic characteristics and performance variables. The performance variables used were the results of a paragraph meaning test, the SAT, and the articulation of initial consonants from the 3-year speech examination; the latter had been shown to have some potentiality for predicting reading performance at later ages.

Those tests which were done were not promising. The results are shown in Tables 18, 19, and 20. Few significant results were obtained and these did not seem to fall into any meaningful pattern. Worth pursuing, perhaps, is the suggestion that changes in socioeconomic characteristics are more likely to be related to the performance of girls than of boys, and are more likely to be manifest in the earliest grades.

TABLE 18

Reading performance (paragraph meaning) by change in sex of head of household

Grades 1-5, race/sex groups

	Male to female	$\bar{X}$	Female to male	$\bar{X}$ score	No change	$\bar{X}$ score	Var.be- tween $\bar{X}$	Var.with- in $\bar{X}$	F
Whites									
Grade 1, boys	53	11.774	50	10.440	208	9.779	85.406	59.511	1.4351
girls	59	11.915	58	14.328	195	11.769	150.936	63.353	2.3825
Grade 2, boys	54	19.204	47	22.894	202	20.233	187.000	128.011	1.4608
girls	55	23.636	60	27.850	204	23.750	414.500	112.053	3.6991
Grade 3, boys	37	26.000	30	27.767	162	28.080	65.188	201.767	0.3231
girls	45	31.200	41	34.585	160	29.912	358.344	153.070	2.3410
Grade 4, boys	31	35.323	15	34.667	110	38.164	153.531	204.806	0.7496
girls	30	40.967	31	40.645	109	38.752	83.031	130.961	0.6340
Grade 5, boys	15	31.000	9	28.444	59	28.932	28.844	169.225	0.1704
girls	14	32.071	19	34.421	66	31.788	51.688	106.444	0.4856
Blacks									
Grade 1, boys	26	9.692	21	10.238	121	9.579	3.893	53.981	0.0721
girls	31	10.742	22	12.136	107	9.841	51.309	63.279	0.8108
Grade 2, boys	25	17.040	22	15.500	124	18.573	100.410	100.648	0.9976
girls	34	22.735	27	24.593	115	19.957	284.375	101.341	2.8061
Grade 3, boys	24	21.333	16	19.688	105	21.810	31.625	133.162	0.2375
girls	34	24.618	21	26.429	90	23.267	92.500	138.316	0.6688
Grade 4, boys	16	22.813	14	28.714	86	27.942	192.750	172.054	1.1203
girls	25	34.000	17	37.588	69	31.449	274.313	133.456	2.0555
Grade 5, boys	15	17.000	9	22.111	51	22.588	183.471	81.406	2.2538
girls	16	24.375	12	25.333	49	24.612	3.418	99.217	0.0344

TABLE 19

Articulation of initial consonants (3-year speech examination) by change in socioeconomic scores, grades 1-5, race/sex groups

	SES up < 22	X Artic. score	SES up > 21	X Artic. score	Var.between X	Var.with- in X	F
Whites							
Grade 1, boys	115	14.287	137	14.255	0.063	11.630	.0054
girls	125	15.040	130	15.615	21.098	11.413	1.8485
Grade 2, boys	108	14.361	129	14.318	0.105	11.519	.0092
girls	125	15.120	131	15.611	15.395	11.127	1.3835
Grade 3, boys	77	14.545	106	14.368	1.402	12.021	.1167
girls	92	15.500	104	15.452	0.113	10.128	.0112
Grade 4, boys	61	14.262	71	14.197	0.137	11.947	.0114
girls	66	15.909	70	15.114	21.457	10.064	2.1321
Grade 5, boys	29	14.897	36	14.028	12.121	8.566	1.4150
girls	41	16.341	35	15.571	11.191	9.943	1.1255
Blacks							
Grade 1, boys	69	14.333	65	14.108	1.699	9.739	.1745
girls	66	15.424	69	15.855	6.258	7.659	.8170
Grade 2, boys	76	14.118	68	14.382	2.496	8.986	.2778
girls	74	15.297	74	15.892	13.078	8.182	1.5984
Grade 3, boys	65	14.338	58	14.483	0.637	8.934	.0713
girls	63	15.476	61	15.836	4.012	7.542	.5319
Grade 4, boys	47	14.170	47	14.128	0.043	9.281	.0046
girls	53	15.396	42	15.929	6.637	8.123	.8170
Grade 5, boys	32	14.813	32	14.688	0.250	9.286	.0264
girls	(not available)						

TABLE 20

SAT scores by change in socioeconomic scores, grades 1-5, race/sex groups

	SES up < 22	X SAT score	SES up > 21	X SAT score	Var.be- tween Xs	Var.with- in Xs	F
Whites							
Grade 1, boys	142	9.775	169	10.004	53.016	59.700	0.8880
	155	11.077	157	13.452	439.875	62.703	7.0152
Grade 2, boys	138	19.587	165	21.194	194.063	128.184	1.5139
	157	23.924	162	25.062	103.188	113.989	0.9052
Grade 3, boys	101	26.634	128	28.547	206.563	200.543	1.0300
	117	30.436	129	31.372	53.688	155.160	0.3460
Grade 4, boys	72	38.500	84	38.774	415.563	202.771	2.0494
	81	38.827	89	40.090	67.563	130.767	0.5167
Grade 5, boys	37	27.189	46	30.913	284.313	164.338	1.7300
	51	31.039	48	33.708	176.125	104.597	1.6838
Blacks							
Grade 1, boys	86	9.477	82	9.890	7.172	53.659	0.1337
	79	9.848	81	10.802	36.426	63.298	0.5755
Grade 2, boys	88	16.636	83	19.349	314.391	99.380	3.1635
	89	22.315	87	20.069	221.875	102.752	2.1593
Grade 3, boys	74	20.676	71	22.352	101.813	131.961	0.7715
	75	24.733	70	23.300	74.438	138.121	0.5389
Grade 4, boys	56	26.286	60	28.300	117.500	172.895	0.6796
	63	32.556	48	33.500	24.313	137.042	0.1774
Grade 5, boys	37	20.243	38	22.553	99.977	83.948	1.1909
	45	24.40	32	25.063	8.211	97.876	0.0839

2. Correlation matrices using multiple variables.

Correlation matrices were produced for a set of variables selected in an attempt to tap a number of dimensions of family background. At the time these were done, data was available only on the first three grades. Means and standard deviations for the variables used are given in Table 21. The correlation matrices are shown in Table 22.

Variables used in Correlation Matrices: Means and Standard Deviations

WHITE FEMALES

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Variables used in Correlation Matrices: Means and Standard Deviations

BLACK MALES

N=90			N=63		N=46		
		First Grade		Second Grade		Third Grade	
		$\bar{x}$	σ	$\bar{x}$	σ	$\bar{x}$	σ
Reading Performance	1	10.25	7.15	19.78	10.41	24.00	11.22
Family income	2	3.46	1.46	3.50	1.53	3.68	1.53
Persons supported	3	5.31	2.43	5.67	2.46	5.30	2.55
Children under 8	4	2.44	1.45	2.61	1.45	2.47	1.50
SE index score	5	30.67	14.40	30.81	15.73	31.53	16.38
Persons per room	6	1.33	0.43	1.35	0.40	1.34	0.38
Moves past 5 years	7	8.75	1.09	XX	XX	XX	XX
Mother's education	8	10.99	2.28	11.09	2.57	11.19	2.35
Mother's age	9	25.47	6.34	26.13	6.57	25.68	6.75
Mother's marriages	10	1.15	0.39	1.17	0.42	1.19	0.45

BLACK FEMALES

		N=82		N=63		N=46	
		First Grade		Second Grade		Third Grade	
		$\bar{x}$	σ	$\bar{x}$	σ	$\bar{x}$	σ
Reading performance	1	10.71	8.44	22.78	9.48	25.66	11.71
Family income	2	3.63	1.38	3.56	1.39	3.55	1.44
Persons supported	3	5.72	2.56	5.50	2.37	5.43	2.32
Children under 8	4	2.63	1.65	2.50	1.57	2.40	1.65
SE index score	5	32.53	14.04	33.94	13.57	33.92	12.90
Persons per room	6	1.39	0.49	1.39	0.48	1.42	0.49
Moves past 5 years	7	8.49	1.74	XX	XX	XX	XX
Mother's education	8	10.55	2.61	10.50	2.36	10.62	2.14
Mother's age	9	24.92	6.17	25.02	6.13	25.02	6.50
Mother's marriages	10	1.18	0.50	1.17	0.46	1.19	0.50

CORRELATION MATRIX:

WHITE MALES, Grade 1
N=178

Table 22

	1	2	3	4	5	6	7	8	9	10	Multiple regression computed t value
1. Reading performance	1.00	0.03	-0.02	-0.02	0.03	-0.14	0.03	0.08	-0.07	-0.07	
PRENATAL INTERVIEW DATA:											
2. Family income (\$1000 brackets)		1.00	0.30	0.11	-0.13	0.13	-0.03	0.06	0.11	-0.05	0.40
3. Number of people supported			1.00	0.75	-0.04	0.29	0.00	-0.04	0.54	0.19	0.36
4. Number of children under 8				1.00	0.06	0.26	-0.05	-0.11	0.34	0.14	0.08
5. Socioeconomic index score (0-98)					1.00	-0.14	0.05	0.03	-0.06	-0.07	0.11
6. Housing: no. of persons per room						1.00	-0.04	-0.10	0.17	0.04	-1.74
7. Housing: no. of moves in past 5 years							1.00	-0.06	0.03	-0.03	XX
8. Child's mother: education (years completed)								1.00	0.11	-0.10	0.86
9. Child's mother: age									1.00	0.46	-0.74
10. Child's mother: no. of marriages										1.00	-0.33

 R (multiple correlation coefficient) = 0.18 R^2 = 0.0320

Significant at the .05 level (none).

CORRELATION MATRIX: WHITE MALES, Grade 2
N=127

Table 22 (cont)

	1	2	3	4	5	6	7	8	9	10	Multiple regression computed t value
1. Reading performance	1.00	-0.03	-0.09	-0.03	0.10	-0.09	0.00	-0.01	-0.16	-0.09	
PRENATAL INTERVIEW DATA:											
2. Family income (\$1000 brackets)		1.00	0.31	0.10	-0.14	0.05	0.00	0.06	0.11	-0.01	0.17
3. Number of people supported			1.00	0.77	0.04	0.23	0.00	-0.02	0.52	0.15	-0.41
4. Number of children under 8				1.00	0.12	0.24	0.00	-0.11	0.39	0.18	0.37
5. Socioeconomic index score (0-98)					1.00	-0.08	0.00	-0.01	-0.03	-0.05	0.90
6. Housing: no. of persons per room						1.00	0.00	-0.11	0.14	0.03	-0.78
7. Housing: no. of moves in past 5 years							0.00	0.00	0.00	0.00	XX
8. Child's mother: education (years completed)								1.00	0.17	-0.08	0.09
9. Child's mother: age									1.00	0.42	-1.13
10. Child's mother: no. of marriages										1.00	-0.26

R (multiple correlation coefficient) = 0.20

$R^2 = 0.0412$

*Significant at the .05 level (none).

CORRELATION MATRIX: WHITE MALES, Grade 3
N=65

Table 22 (cont)

	1	2	3	4	5	6	7	8	9	10	Multiple regression computed t value
1. Reading performance	1.00	-0.03	-0.16	-0.04	-0.11	0.04	0.00	-0.12	-0.14	-0.14	
PRENATAL INTERVIEW DATA:											
2. Family income (\$1000 brackets)		1.00	0.19	-0.07	-0.09	0.09	0.00	0.14	0.13	-0.04	0.14
3. Number of people supported			1.00	0.70	0.25	0.28	0.00	0.00	0.60	0.35	-0.87
4. Number of children under 8				1.00	0.25	0.27	0.00	-0.13	0.27	0.30	0.67
5. Socioeconomic index score (0-98)					1.00	-0.04	0.00	-0.08	0.06	0.01	-0.70
6. Housing: no. of persons per room						1.00	0.00	-0.09	0.16	-0.01	0.32
7. Housing: no. of moves in past 5 years							0.00	0.00	0.00	0.00	XX
8. Child's mother: education (years completed)								1.00	0.21	-0.10	-0.93
9. Child's mother: age									1.00	0.39	0.12
10. Child's mother: no. of marriages										1.00	-0.86

R (multiple correlation coefficient) = 0.26

$$R^2 = 0.0684$$

*Significant at the .05 level (none).

CORRELATION MATRIX: WHITE FEMALES, Grade 1
N=178

Table 22 (cont)

	1	2	3	4	5	6	7	8	9	10	Multiple regression ¹ computed t value
1. Reading performance	1.00	0.13	-0.13	-0.12	0.26	-0.13	-0.06	0.09	-0.02	-0.03	
RENATAL INTERVIEW DATA:											
2. Family income (\$1000 brackets)		1.00	0.29	0.21	0.01	-0.04	-0.03	0.09	0.02	-0.01	2.34*
3. Number of people supported			1.00	0.82	-0.06	0.34	0.09	-0.13	0.44	0.13	-1.27
4. Number of children under 8				1.00	-0.01	0.36	0.11	-0.11	0.28	-0.03	-0.14
5. Socioeconomic index score (0-98)					1.00	-0.14	-0.01	0.14	-0.13	-0.06	3.44*
6. Housing: no. of persons per room						1.00	0.06	0.05	0.23	0.01	-0.60
7. Housing: no. of moves in past 5 years							1.00	-0.02	0.06	0.11	XX
8. Child's mother: education (years completed)								1.00	-0.04	-0.07	0.21
9. Child's mother: age									1.00	0.40	1.45
10. Child's mother: no. of marriages										1.00	-0.55

R (Multiple correlation coefficient) = 0.35

$R^2 = 0.1231$

*Significant at the .05 level.

CORRELATION MATRIX: WHITE FEMALES, Grade 2
N=108

Table 22 (cont)

	1	2	3	4	5	6	7	8	9	10	Multiple regression computed t value
1. Reading performance	1.00	0.07	-0.11	-0.13	0.23	-0.06	0.00	0.07	-0.16	-0.16	
RENATAL INTERVIEW DATA:											
2. Family income (\$1000 brackets)		1.00	0.34	0.21	0.09	-0.11	0.00	0.10	-0.00	-0.02	0.82
3. Number of people supported			1.00	0.78	0.02	0.32	0.00	-0.08	0.38	0.10	0.22
4. Number of children under 8				1.00	0.08	0.37	0.00	-0.09	0.20	-0.08	-1.36
5. Socioeconomic index score (0-98)					1.00	-0.07	0.00	0.08	-0.17	-0.06	2.31*
6. Housing: no. of persons per room						1.00	0.00	0.09	0.18	0.01	0.43
7. Housing: no. of moves in past 5 years							0.00	0.00	0.00	0.00	XX
8. Child's mother: education (years completed)								1.00	-0.04	-0.07	0.09
9. Child's mother: age									1.00	0.44	-0.27
10. Child's mother: no. of marriages										1.00	-1.38

R (multiple correlation coefficient) = 0.33

$R^2 = 0.1088$

*Significant at the .05 level.

CORRELATION MATRIX: WHITE FEMALES, Grade 3
N=53

Table 22 (cont)

	1	2	3	4	5	6	7	8	9	10	Multiple regression computed 't value
1. Reading performance	1.00	0.14	-0.12	-0.09	0.18	0.03	0.00	0.15	0.13	-0.20	
PRENATAL INTERVIEW DATA:											
2. Family income (\$1000 brackets)		1.00	0.27	0.14	-0.02	-0.11	0.00	0.23	0.06	-0.04	1.16
3. Number of people supported			1.00	0.88	-0.09	0.34	0.00	-0.17	0.46	0.05	-1.01
4. Number of children under 8				1.00	0.03	0.37	0.00	-0.07	0.32	-0.05	-0.06
5. Socioeconomic index score (0-98)					1.00	-0.19	0.00	0.02	-0.15	0.04	1.89
6. Housing: no. of persons per room						1.00	0.00	0.07	0.31	0.12	0.70
7. Housing: no. of moves in past 5 years							0.00	0.00	0.00	0.00	XX
8. Child's mother: education (years completed)								1.00	-0.29	-0.04	1.02
9. Child's mother: age									1.00	0.32	2.68*
10. Child's mother: no. of marriages										1.00	-2.43**

R (multiple correlation coefficient) = 0.52

$R^2 = 0.2648$

*Significant at the .05 level.

CORRELATION MATRIX:

BLACK MALES, Grade 1
N=90

Table 22 (cont)

	1	2	3	4	5	6	7	8	9	10	Multiple regression computed t value
1. Reading performance	1.00	-0.22	-0.31	-0.31	0.21	-0.12	0.10	0.12	-0.11	-0.09	
PRENATAL INTERVIEW DATA:											
2. Family income (\$1000 brackets)		1.00	0.32	0.25	-0.21	-0.07	0.07	0.04	0.32	0.15	-1.26
3. Number of people supported			1.00	0.72	-0.33	0.32	0.10	-0.22	0.67	0.23	-1.34
4. Number of children under 8				1.00	-0.25	0.31	0.01	-0.26	0.37	0.15	-0.76
5. Socioeconomic index score (0-98)					1.00	-0.12	0.04	0.27	-0.33	-0.26	1.07
6. Housing: no. of persons per room						1.00	0.09	-0.03	0.16	0.64	-0.23
7. Housing: no. of moves in past 5 years							1.00	-0.03	0.07	-0.01	XX
8. Child's mother: education (years completed)								1.00	-0.06	-0.22	0.06
9. Child's mother: age									1.00	0.43	1.37
10. Child's mother: no. of marriages										1.00	-0.45

R (multiple correlation coefficient) = 0.39

 $R^2 = 0.1551$

*Significant at the .05 level (none)

CORRELATION MATRIX: BLACK MALES, Grade 2
N=63

Table 22 (cont)

	1	2	3	4	5	6	7	8	9	10	Multiple regression: computed t value
1. Reading performance	1.00	0.01	-0.24	-0.29	0.17	-0.17	0.00	0.14	-0.08	-0.19	
PRENATAL INTERVIEW DATA:											
2. Family income (\$1000 brackets)		1.00	0.33	0.30	-0.28	-0.09	0.00	0.06	0.27	0.11	0.84
3. Number of people supported			1.00	0.68	-0.36	0.31	0.00	-0.22	0.63	0.26	-0.67
4. Number of children under 8				1.00	-0.29	0.30	0.00	-0.29	0.34	0.11	-1.35
5. Socioeconomic index score (0-98)					1.00	-0.19	0.00	0.30	-0.32	-0.29	0.59
6. Housing: no. of persons per room						1.00	0.00	-0.06	0.20	0.12	-0.30
7. Housing: no. of moves in past 5 years							0.00	0.00	0.00	0.00	XX
8. Child's mother: education (years completed)								1.00	-0.07	-0.24	-0.26
9. Child's mother: age									1.00	0.45	1.07
10. Child's mother: no. of marriages										1.00	-1.41

R (multiple correlation coefficient) = 0.38

$R^2 = 0.1461$

Significant at the .05 level (none).

CORRELATION MATRIX: BLACK MALES, Grade 3
N=46

Table 22 (cont)

	1	2	3	4	5	6	7	8	9	10	Multiple regression computed t value
1. Reading performance	1.00	0.02	-0.20	-0.30	0.22	-0.29	0.00	0.29	-0.25	-0.19	
PRENATAL INTERVIEW DATA:											
2. Family income (\$1000 brackets)		1.00	0.47	0.40	-0.47	-0.04	0.00	-0.04	0.37	0.09	0.93
3. Number of people supported			1.00	0.76	-0.34	0.31	0.00	-0.24	0.73	0.35	1.38
4. Number of children under 8				1.00	-0.34	0.31	0.00	-0.37	0.43	0.19	-1.43
5. Socioeconomic index score (0-98)					1.00	-0.10	0.00	0.30	-0.30	-0.38	0.89
6. Housing: no. of persons per room						1.00	0.00	-0.13	0.15	0.22	-1.43
7. Housing: no. of moves in past 5 years							0.00	0.00	0.00	0.00	XX
8. Child's mother: education (years completed)								1.00	-0.09	-0.18	1.05
9. Child's mother: age									1.00	0.51	-1.76
10. Child's mother: no. of marriages										1.00	0.32

R (multiple correlation coefficient) = 0.51

$R^2 = 0.2600$

* Significant at the .05 level (none).

CORRELATION MATRIX: BLACK FEMALES, Grade 1
N=82

Table 22 (cont)

	1	2	3	4	5	6	7	8	9	10	Multiple regression computed t value
1. Reading performance	1.00	0.23	0.08	-0.06	0.14	-0.14	0.01	0.10	0.15	0.11	
PRENATAL INTERVIEW DATA:											
2. Family income (\$1000 brackets)		1.00	0.44	0.25	0.10	-0.04	-0.01	-0.13	0.14	0.19	1.29
3. Number of people supported			1.00	0.75	-0.24	0.37	-0.02	-0.32	0.55	0.26	0.87
4. Number of children under 8				1.00	-0.20	0.26	0.05	-0.17	0.40	0.25	-1.48
5. Socioeconomic index score (0-98)			0		1.00	-0.20	0.16	0.33	-0.28	-0.04	0.85
6. Housing: no. of persons per room						1.00	0.16	-0.14	0.22	0.10	-1.23
7. Housing: no. of moves in past 5 years							1.00	-0.17	-0.00	0.04	XX
8. Child's mother: education (years completed)								1.00	-0.23	-0.16	1.18
9. Child's mother: age									1.00	0.32	1.46
10. Child's mother: no. of marriages										1.00	0.62

R (multiple correlation coefficient) = 0.39

$R^2 = 0.1523$

*Significant at the .05 level (none).

CORRELATION MATRIX: BLACK FEMALES, Grade 2
N=63

Table 22 (cont)

	1	2	3	4	5	6	7	8	9	10	Multiple regression computed t value
1. Reading performance	1.00	0.10	0.17	0.05	0.21	-0.04	0.00	0.23	0.05	-0.02	
PRENATAL INTERVIEW DATA:											
2. Family income (\$1000 brackets)		1.00	0.32	0.15	0.22	-0.11	0.00	-0.07	0.09	0.17	-0.53
3. Number of people supported			1.00	0.77	-0.19	0.40	0.00	-0.21	0.56	0.14	2.27*
4. Number of children under 8				1.00	-0.16	0.32	0.00	-0.11	0.39	0.14	-1.31
5. Socioeconomic index score (0-98)					1.00	-0.34	0.00	0.27	-0.23	-0.13	1.21
6. Housing: no. of persons per room						1.00	0.00	-0.09	0.24	0.06	-0.69
7. Housing: no. of moves in past 5 years							0.00	0.00	0.00	0.00	XX
8. Child's mother: education (years completed)								1.00	-0.07	-0.13	1.96*
9. Child's mother: age									1.00	0.21	-0.52
10. Child's mother: no. of marriages										1.00	0.22

R (multiple correlation coefficient) = 0.41

$R^2 = 0.1720$

*Significant at the .05 level.

CORRELATION MATRIX:

BLACK FEMALES, Grade 3
N=46

Table 22 (cont)

	1	2	3	4	5	6	7	8	9	10	Multiple regression computed t values
1. Reading performance	1.00	0.23	-0.10	-0.26	0.18	-0.22	0.00	0.14	-0.23	0.08	
PRENATAL INTERVIEW DATA:											
2. Family income (\$1000 brackets)		1.00	0.35	0.11	0.17	-0.07	0.00	-0.11	0.08	0.21	0.58
3. Number of people supported			1.00	0.76	-0.18	0.38	0.00	-0.32	0.50	0.17	1.57
4. Number of children under 8				1.00	-0.15	0.38	0.00	-0.15	0.38	0.33	-2.02*
5. Socioeconomic index score (0-98)					1.00	-0.37	0.00	0.33	-0.26	-0.27	0.30
6. Housing: no. of persons per room						1.00	0.00	-0.08	0.13	-0.06	-0.61
7. Housing: no. of moves in past 5 years							1.00	0.00	0.00	0.00	xx
8. Child's mother: education (years completed)								1.00	-0.12	-0.13	1.22
9. Child's mother: age									1.00	0.20	-1.52
9. Child's mother: no. of marriages										1.00	1.34

 R (multiple correlation coefficient) = 0.50 $R^2 = 0.25$

*Significant at the .05 level.

3. Regression analyses with multiple variables.

Regression analyses, also done before the data were complete, suggest that the socioeconomic index score itself and mother's educational level contribute most to correlations with children's SAT scores. These analyses are shown in Table 23.

Dependent variable: Reading performance

Independent variables: 15 socioeconomic items

GRADE 1 N = 846

	$\bar{X}$	σ	Correlation X vs Y	$R = 0.27$ $R^2 = 0.0728$ Computed t value	$R = 0.23$ $R^2 = 0.0545$ Computed t value	$R = 0.25$ $R^2 = 0.0641$ Computed t value
1. Reading performance	10.59	7.88	_____	_____	_____	_____
2. Race	_____	_____	0.09	0.72	1.22	0.86
3. Child's mother's education	10.51	1.78	0.16	2.11*	_____	3.25*
4. Socioeconomic index score	3.22	1.41	0.16	2.80*	3.93*	_____
5. Per capita income	850.74	631.41	0.16	3.26*	_____	3.33*
6. Source of income (wages, welfare, etc.)	_____	_____	-0.07	0.14	-0.81	-0.13
7. Reading materials in home: newspapers	_____	_____	0.05	-0.62	-0.67	-0.52
8. Reading materials in home: magazines	_____	_____	0.08	0.81	0.81	0.91
9. Reading materials in home: books	_____	_____	0.06	0.44	0.48	0.28
10. Child's mother's religion +	_____	_____	-0.09	-1.18	-1.35	-1.26
11. Child's mother's age	24.00	5.97	-0.02	0.77	-0.01	0.71
12. Housing: persons per room	1.02	1.17	-0.01	-0.93	-0.78	-0.88
13. Male head of household	_____	_____	0.02	0.39	-0.25	0.49
14. Mother's educational expectations for children	_____	_____	0.08	1.32	1.44	1.46
15. Mother's own attitude toward reading	_____	_____	-0.02	-0.65	-0.65	-0.46
16. Mother's own history of reading problems	_____	_____	-0.09	-2.68*	-3.21*	-2.60*

R = multiple correlation coefficient.

R^2 = multiple correlation coefficient squared.

t value: test that partial regression coefficient = 0.

*Significant at the .05 level.

F 15 = 4.35
830

F 13 = 3.69
832

F 14 = 4.06
831

+Catholic; "middle class" Protestant denominations; fundamentalist Protestant denominations; Baptists; all other

27

Table 25 (cont.)

Dependent variable: Reading performance
 Independent variables: 15 socioeconomic items

GRADE 2 N = 614	$\bar{X}$	σ	Correlation X vs Y	$R = 0.40$ $R^2 = 0.1575$	$R = 0.39$ $R^2 = 0.1517$	$R = 0.38$ $R^2 = 0.1469$
				Computed t value	Computed t value	Computed t value
1. Reading performance	23.12	7.20	—	—	—	—
2. Race	—	—	0.30	4.91*	5.07*	5.00*
3. Child's mother's education	10.55	1.73	0.15	1.78	—	2.72*
4. Socioeconomic index score	3.24	1.43	0.18	2.74*	3.48*	—
5. Per capita income	847.87	667.34	0.15	0.79	—	0.84
6. Source of income (wages, welfare, etc.)	—	—	-0.14	-1.57	-1.93	-1.85
7. Reading materials in home: newspapers	—	—	0.11	-0.17	-0.21	0.02
8. Reading materials in home: magazines	—	—	0.09	0.77	0.82	0.79
9. Reading materials in home: books	—	—	0.11	1.10	1.07	0.89
10. Child's mother's religion +	—	—	-0.23	-2.05*	-2.26*	-2.07*
11. Child's mother's age	23.95	6.10	0.01	1.64	1.42	1.59
12. Housing: persons per room	1.08	1.28	0.02	-0.80	-0.75	-0.81
13. Male head of household	—	—	0.01	-1.57	-1.91	-1.46
14. Mother's educational expectations for children	—	—	0.09	0.80	0.95	0.92
15. Mother's own attitude toward reading	—	—	0.02	-0.40	0.47	-0.11
16. Mother's own history of reading problems	—	—	-0.09	-2.44*	-2.77*	-2.39*

R = multiple correlation coefficient.

R^2 = multiple correlation coefficient squared.

t value: test that partial regression coefficient = 0.

250 Significant at the .05 level.

F 15 = 7.45
598

F 13 = 8.25
600

F 14 = 7.37
599

*Catholic; "middle class" Protestant denominations; fundamentalist Protestant denominations; Baptists; all other. 29

Dependent variable: Reading performance
Independent variables: 15 socioeconomic items

GRADE 3 N = 380

	$\bar{X}$	σ	Correlation X vs Y	$R = 0.31$ $R^2 = 0.0948$ Computed t value	$R = 0.30$ $R^2 = 0.0902$ Computed t value	$R = 0.29$ $R^2 = 0.0855$ Computed t value
. Reading performance	11.93	8.13	_____	_____	_____	_____
. Race	_____	_____	0.11	0.73	0.80	0.78
. Child's mother's education	10.60	1.57	0.17	1.24	_____	1.95*
. Socioeconomic index score	3.24	1.44	0.15	1.93*	2.49*	_____
. Per capita income	799.82	547.07	0.11	0.39	_____	0.42
. Source of income (wages, welfare, etc.)	_____	_____	-0.08	-1.43	-1.69	-1.52
. Reading materials in home: newspapers	_____	_____	0.02	-0.25	-0.36	-0.09
. Reading materials in home: magazines	_____	_____	0.05	0.46	0.53	0.57
. Reading materials in home: books	_____	_____	0.02	0.14	0.16	-0.01
. Child's mother's religion +	_____	_____	-0.13	-1.50	-1.53	-1.59
. Child's mother's age	24.04	6.18	-0.06	-0.43	-0.58	-0.40
. Housing: persons per room	1.09	1.26	-0.04	-1.19	-1.26	-1.22
. Male head of household	_____	_____	-0.05	-1.63	-1.77	-1.55
. Mother's educational expectations for children	_____	_____	0.04	0.39	0.53	0.45
. Mother's own attitude toward reading	_____	_____	-0.03	-0.44	-0.56	-0.21
. Mother's own history of reading problems	_____	_____	-0.18	-3.16*	-3.61*	-3.03*
				$F_{364}^{15} = 2.54$	$F_{366}^{13} = 2.79$	$F_{365}^{14} = 2.4$

R = multiple correlation coefficient.

R² = multiple correlation coefficient squared.

t value: test that partial regression coefficient = 0.

252 Significant at the .05 level.

*Catholic; "middle class" Protestant denominations; fundamentalist Protestant denominations; Baptists; all other 25

Dependent variable: Reading performance
 Independent variables: 15 socioeconomic items

GRADE 4 N = 160

	$\bar{X}$	σ	Correlation X vs. Y	$R^2 = 0.2725$ Computed t value	$R^2 = 0.2467$ Computed t value	$R^2 = 0.2698$ Computed t value
. Reading performance	36.64	12.74	_____	_____	_____	_____
. Race	_____	_____	0.34	2.58*	2.90*	2.55*
. Child's mother's education	10.72	1.58	0.18	1.57	_____	1.86
. Socioeconomic index score	3.35	1.46	0.16	0.73	1.29	_____
. Per capita income	805.44	480.07	0.30	1.35	_____	1.35
. Source of income (wages, welfare, etc.)	_____	_____	-0.26	-2.23*	-2.87*	-2.32*
. Reading materials in home: newspapers	_____	_____	0.09	-0.12	-0.23	-0.04
. Reading materials in home: magazines	_____	_____	0.15	1.52	1.77	1.64
. Reading materials in home: books	_____	_____	0.09	0.02	-0.00	-0.08
. Child's mother's religion +	_____	_____	-0.26	-0.85	-0.94	-0.99
. Child's mother's age	23.82	5.95	0.10	1.35	1.04	1.44
. Housing: persons per room	1.09	1.25	0.08	0.42	0.41	0.43
. Male head of household	_____	_____	0.04	-0.78	-1.20	-0.78
. Mother's educational expectations for children	_____	_____	0.01	-0.83	-0.77	-0.79
. Mother's own attitude toward reading	_____	_____	-0.14	-2.52*	-2.79*	-2.43*
. Mother's own history of reading problems	_____	_____	-0.02	0.78	0.39	0.86
				$F_{15}^{144} = 3.60$	$F_{13}^{146} = 3.68$	$F_{14}^{145} = 3.83$

N = multiple correlation coefficient.

R^2 = multiple correlation coefficient squared.

t value: test that partial regression coefficient = 0.
 Significant at the .05 level.

+ Catholic; "middle class" Protestant denominations; fundamentalist Protestant denominations: Baptists: all other

MULTIPLE REGRESSION ANALYSIS

Table 23

Dependent variable: Reading performance

Independent variables: 15 socioeconomic items

GRADE 1 N = 846

	$\bar{X}$	σ	Correlation X vs Y	ALL VARIABLES $R^2 = 0.27$ $R^2 = 0.0728$ Computed t value	WITHOUT 3 & 5 $R^2 = 0.23$ $R^2 = 0.0545$ Computed t-value	WITHOUT 4 $R^2 = 0.25$ $R^2 = 0.0641$ Computed t-value
1. Reading performance	10.59	7.88	—	—	—	—
2. Race	—	—	0.09	0.72	1.22	0.86
3. Child's mother's education	10.51	1.78	0.16	2.11*	—	3.25*
4. Socioeconomic index score	3.22	1.41	0.16	2.80*	3.93*	—
5. Per capita income	850.74	631.41	0.16	3.26*	—	3.33*
6. Source of income (wages, welfare, etc.)	—	—	-0.07	0.14	-0.81	-0.13
7. Reading materials in home: newspapers	—	—	0.05	-0.62	-0.67	-0.52
8. Reading materials in home: magazines	—	—	0.08	0.81	0.81	0.91
9. Reading materials in home: books	—	—	0.06	0.44	0.48	0.28
10. Child's mother's religion +	—	—	-0.09	-1.18	-1.35	-1.26
11. Child's mother's age	24.00	5.97	-0.02	0.77	-0.01	0.71
12. Housing: persons per room	1.02	1.17	-0.01	-0.93	-0.78	-0.88
13. Male head of household	—	—	0.02	0.39	-0.25	0.49
14. Mother's educational expectations for children	—	—	0.08	1.32	1.44*	1.46
15. Mother's own attitude toward reading	—	—	-0.02	-0.65	-0.65	-0.46
16. Mother's own history of reading problems	—	—	-0.09	-2.68*	-3.21*	-2.60*
				$F_{15} = 4.35$ 830	$F_{13} = 3.69$ 832	$F_{14} = 4.06$ 831

R = multiple correlation coefficient.

R^2 = multiple correlation coefficient squared.

t value: test that partial regression coefficient = 0.

*Significant at the .05 level.

+Catholic; "middle class" Protestant denominations; fundamentalist Protestant denominations; Baptists; all other.

MULTIPLE REGRESSION ANALYSIS

Table 23 (cont)

Dependent variable: Reading performance

Independent variables: 15 socioeconomic items

GRADE 2 N = 614

ALL VARIABLES	WITHOUT 3 & 5	WITHOUT 4
R = 0.40 R ² = 0.1575	R = 0.39 R ² = 0.1517	R = 0.38 R ² = 0.1469
Computed t value	Computed t value	Computed t value
_____	_____	_____
4.91*	5.07*	5.00*
1.78	_____	2.72*
2.74*	3.48*	_____
0.79	_____	0.84
-1.57	-1.93	-1.85
-0.17	-0.21	0.02
0.77	0.82	0.79
1.10	1.07	0.89
-2.05*	-2.26*	-2.07*
1.64	1.42	1.59
-0.80	-0.75	-0.81
-1.57	-1.91	-1.46
0.80	0.95	0.92
-0.40	0.47	-0.11
-2.44*	-2.77*	-2.39*
F 15 = 7.45 598	F 13 = 8.25 600	F 14 = 7.37 599

R = multiple correlation coefficient.

R² = multiple correlation coefficient squared.

t value: test that partial regression coefficient = 0.

*Significant at the .05 level.

+Catholic; "middle class" Protestant denominations; fundamentalist Protestant denominations; Baptists; all other.

MULTIPLE REGRESSION ANALYSIS

Dependent variable: Reading performance

Independent variables: 15 socioeconomic items

GRADE 3 N = 380

Table 23 (cont)

	$\bar{X}$	σ	Correlation X vs Y	ALL VARIABLES	WITHOUT 3 & 5	WITHOUT 4
				R = 0.31 R ² = 0.0948	R = 0.30 R ² = 0.0902	R = 0.29 R ² = 0.0855
				Computed t value	Computed t value	Computed t value
1. Reading performance	11.93	8.13	—	—	—	—
2. Race	—	—	0.11	0.73	0.80	0.78
3. Child's mother's education	10.60	1.57	0.17	1.24	—	1.95*
4. Socioeconomic index score	3.24	1.44	0.15	1.93*	2.49*	—
5. Per capita income	799.82	547.07	0.11	0.39	—	0.42
6. Source of income (wages, welfare, etc.)	—	—	-0.08	-1.43	-1.69	-1.52
7. Reading materials in home: newspapers	—	—	0.02	-0.25	-0.36	-0.09
8. Reading materials in home: magazines	—	—	0.05	0.46	0.53	0.57
9. Reading materials in home: books	—	—	0.02	0.14	0.16	-0.01
10. Child's mother's religion +	—	—	-0.13	-1.50	-1.53	-1.59
11. Child's mother's age	24.04	6.18	-0.06	-0.43	-0.58	-0.40
12. Housing: persons per room	1.09	1.26	-0.04	-1.19	-1.26	-1.22
13. Male head of household	—	—	-0.05	-1.63	-1.77	-1.55
14. Mother's educational expectations for children	—	—	0.04	0.39	0.53	0.45
15. Mother's own attitude toward reading	—	—	-0.03	-0.44	-0.56	-0.21
16. Mother's own history of reading problems	—	—	-0.18	-3.16*	-3.61*	-3.03*
				F ₁₅ ₃₆₄ = 2.54	F ₁₃ ₃₆₆ = 2.79	F ₁₄ ₃₆₅ = 2.44

R = multiple correlation coefficient.

R² = multiple correlation coefficient squared.

t value: test that partial regression coefficient = 0.

*Significant at the .05 level.

+Catholic; "middle class" Protestant denominations; fundamentalist Protestant denominations; Baptists; all other.

MULTIPLE REGRESSION ANALYSIS

Dependent variable: Reading performance

Independent variables: 15 socioeconomic items

GRADE 4 N = 160

Table 23 (cont)

	$\bar{X}$	σ	Correlation X vs Y	ALL VARIABLES	WITHOUT 3 & 5	WITHOUT 4
				$R = 0.52$ $R^2 = 0.2725$	$R = 0.50$ $R^2 = 0.2467$	$R = 0.52$ $R^2 = 0.2698$
				Computed t value	Computed t value	Computed t value
1. Reading performance	36.64	12.74	—	—	—	—
2. Race	—	—	0.34	2.58*	2.90*	2.55*
3. Child's mother's education	10.72	1.58	0.18	1.57	—	1.86
4. Socioeconomic index score	3.35	1.46	0.16	0.73	1.29	—
5. Per capita income	805.44	480.07	0.30	1.35	—	1.35
6. Source of income (wages, welfare, etc.)	—	—	-0.26	-2.23*	-2.87*	-2.32*
7. Reading materials in home: newspapers	—	—	0.09	-0.12	-0.23	-0.04
8. Reading materials in home: magazines	—	—	0.15	1.52	1.77	1.64
9. Reading materials in home: books	—	—	0.09	0.02	-0.00	-0.08
10. Child's mother's religion +	—	—	-0.26	-0.85	-0.94	-0.99
11. Child's mother's age	23.82	5.95	0.10	1.35	1.04	1.44
12. Housing: persons per room	1.09	1.25	0.08	0.42	0.41	0.43
13. Male head of household	—	—	0.04	-0.78	-1.20	-0.78
14. Mother's educational expectations for children	—	—	0.01	-0.83	-0.77	-0.79
15. Mother's own attitude toward reading	—	—	-0.14	-2.52*	-2.79*	-2.43*
16. Mother's own history of reading problems	—	—	-0.02	0.78	0.39	0.96
				$F_{15}^{144} = 3.60$	$F_{13}^{146} = 3.68$	$F_{14}^{145} = 3.83$

R = multiple correlation coefficient.

R² = multiple correlation coefficient squared.

t value: test that partial regression coefficient = 0.

*Significant at the .05 level.

+Catholic; "middle class" Protestant denominations: funds

4. Analysis of variance: mother's educational level and children's performance.

Mother's educational level was analyzed in relation to children's scores on paragraph meaning. Positive associations were found: White males in grades 1-4; White females in grades 1,2,4,5; Black males in grades 1,2,and 5; and Black females in grades 2 and 3. (Data for grade 6 were incomplete and are not included here.)

It is not clear why significant results are frequent for all groups but do not form an uninterrupted series for any group. These results do suggest that positive or negative associations at any one grade level are not conclusive.

TABLE 24

Analysis of variance: Mother's educational level (grade completed)
and child's SAT paragraph meaning scores by grade and race/sex groups.

Paragraph meaning scores range from 0-38 in grades 1-2, and from 0-60 in grades 4-6.

Mother's educational level is treated in three categories: none through 10th grade, grades 11-12, and 1 year of college or more.

	00-10	11-12	13+
GRADE 1			
<u>White males</u>			
<u>N</u>	135	199	21
<u>X</u>	9.244	10.698	13.524
Among ss: 200.105; DF = 2.0			
Within ss: 57.597; DF = 352.0			
F = 3.4742, P < .05			
<u>White females</u>			
<u>N</u>	128	203	22
<u>X</u>	10.634	12.542	14.500
Among ss: 212.730; DF = 2.0			
Within ss: 62.293; DF = 350.0			
F = 3.4150, P < .05			
<u>Negro males</u>			
<u>N</u>	67	102	15
<u>X</u>	8.418	9.941	15.000
Among ss: 156.912; DF = 2.0			
Within ss: 50.416; DF = 181.0			
F = 3.1124, P < .05			
<u>Negro females</u>			
<u>N</u>	57	105	15
<u>X</u>	9.193	10.714	11.467
Among ss: 54.133; DF = 2.0			
Within ss: 62.092; DF = 174.0			
F = 0.8718, not significant			
GRADE 2			
<u>White males</u>			
<u>N</u>	127	194	22
<u>X</u>	19.220	20.985	27.455
Among ss: 648.281; DF = 2.0			
Within ss: 127.701; DF = 340.0			
F = 5.0766, P < .01			

TABLE 24 (cont.)

	00-10	11-12	13+
GRADE 2 (cont)			
White females			
<u>N</u>	129	208	22
<u>X</u>	22.109	25.159	29.864
Among ss: 726.438; DF = 2.0			
Within ss: 109.873; DF = 356.0			
F = 6.6116, P < .01			
Negro males			
<u>N</u>	72	103	16
<u>X</u>	15.208	18.476	23.563
Among ss: 529.359; DF = 2.0			
Within ss: 93.678; DF = 188.0			
F = 5.6508, P < .01			
Negro females			
<u>N</u>	64	113	16
<u>X</u>	19.547	20.681	27.063
Among ss: 364.688; DF = 2.0			
Within ss: 99.460; DF = 190.0			
F = 3.6667, P < .05			
GRADE 3			
White males			
<u>N</u>	102	142	18
<u>X</u>	25.853	28.570	38.111
Among ss: 1174.594; DF = 2.0			
Within ss: 196.816; DF = 259.0			
F = 5.9680, P < .01			
White females			
<u>N</u>	103	162	14
<u>X</u>	29.660	31.963	35.857
Among ss: 319.406; DF = 2.0			
Within ss: 151.307; DF = 276.0			
F = 2.1110, not significant			
Negro males			
<u>N</u>	55	93	12
<u>X</u>	19.291	22.129	25.833
Among ss: 264.875; DF = 2.0			
Within ss: 130.646; DF = 157.0			
F = 2.0274, not significant			
Negro females			
<u>N</u>	52	95	15
<u>X</u>	22.135	23.853	32.533
Among ss: 636.750; DF = 2.0			
Within ss: 131.369; DF = 159.0			
F = 4.8470, P < .01			

TABLE 24 (cont.)

	00-10	11-12	13+
GRADE 4			
White males			
<u>N</u>	72	91	11
<u>X</u>	34.278	38.055	49.000
Among ss:	1106.469;	DF = 2.0	
Within ss:	193.294;	DF = 171.0	
F = 5.7243, P < .01			
White females			
<u>N</u>	70	115	12
<u>X</u>	37.814	40.487	47.500
Among ss:	518.219;	DF = 2.0	
Within ss:	118.806;	DF = 194.0	
F = 4.3619, P < .05			
Negro males			
<u>N</u>	43	71	11
<u>X</u>	23.674	28.056	30.000
Among ss:	322.000;	DF = 2.0	
Within ss:	168.912;	DF = 122.0	
F = 1.9063, not significant			
Negro females			
<u>N</u>	41	69	12
<u>X</u>	31.073	33.058	39.500
Among ss:	329.656;	DF = 2.0	
Within ss:	130.535;	DF = 119.0	
F = 2.5254, not significant			
GRADE 5			
White males			
<u>N</u>	36	51	3
<u>X</u>	27.861	30.941	39.667
Among ss:	245.063;	DF = 2.0	
Within ss:	161.884;	DF = 87.0	
F = 1.5138, not significant			
White females			
<u>N</u>	36	77	4
<u>X</u>	29.472	33.766	38.750
Among ss:	304.094;	DF = 2.0	
Within ss:	97.154;	DF = 114.0	
F = 3.1300, P < .05			
Negro males			
<u>N</u>	28	42	7
<u>X</u>	16.929	22.976	28.857
Among ss:	526.412;	DF = 2.0	
Within ss:	71.861;	DF = 74.0	
F = 7.3254, P < .001			
Negro females			
<u>N</u>	26	46	8
<u>X</u>	23.308	24.435	31.125
Among ss:	191.885;	DF = 2.0	
Within ss:	90.828;	DF = 77.0	
F = 2.1126, not significant			

5. K-means groups.

By a process which is described in more detail elsewhere, four groups of children were segregated on the basis of their reading performance over time, i.e., as measured in the first and again in the sixth grade. (These clusters of children are referred to as "K-means groups", from the shorthand term used for the statistical technique used to segregate them.) The four groups were characterized as follows: 1.) children who read well in both the first and the sixth grades (identified in the tables as H-H); 2.) children who read poorly in the first grade and poorly in the sixth grade (L-L); 3.) children who read poorly in the first grade but who improved somewhat by the sixth grade (L-M); and 4.) children who read poorly in the first grade but who were reading well by the sixth grade (L-H).

A search was made for distinctive social characteristics of these groups, that is for socioeconomic and home environment variables which differed in their distribution from one K-means group to another and so might serve as diagnostic criteria. If such criteria could be found, their usefulness would be greatest the earlier they appear in a child's school life. The social variables available in the Reading Study data are suitable in this respect, since they were based on information obtained during the mother's pregnancy and when the child was five and seven years old.

The test of significance used in assessing differential distributions was Chi-square, and the level at which significance was accepted was $P \leq .05$. The number of children in each K-means group was not large, so that response categories were often combined.

A few variables displayed significantly different distributions among the four performance (K-means) groups. These were: (137) the number of children under 8 years of age in the family at the time of the prenatal interview (Table 25); (146) the mother's education (Table 26); (238, 240, 241) mother's evaluation of child's knowledge of the alphabet, ability to count, and ability to print his own name at age 5 (Table 28); (244) the style of teaching used by a mother with her preschool child (Table 29); (268) the presence of an older sibling with a reading problem (Table 31); (273) a mother's education aspirations for her children (Table 32).

Inspection of the data suggested that in some cases, the H-H group accounted for most of the difference between groups. Therefore, tests of significance were performed excluding the H-H group (already sufficiently distinctive by virtue of the fact that the children in this group read well in the first grade).

Only two items showed distributions which differed among the three remaining K-means groups. These are: 1) mother's education (Table 27), and 2) her style of teaching skills to her children (Table 30).

Inspection of the tables which include the H-H group and those which do not suggests that both the H-H and the L-H mothers are characterized by educational levels of high school graduate or above and by a greater use of non-casual styles of teaching; conversely, children who show no improvement in their reading skills, or only some improvement, from first to sixth grade, are more likely to have mothers with less than a 12th grade education and mothers whose style of parental teaching is off-hand or casual.

TABLE 25

Number of Children in the Family Under 8 Years of Age
(Variable 137, prenatal interview)

K-means group	0-1	2	3 or more	Total
H-H	25 (25%)	7 (19%)	5 (8%)	37 (19%)
L-L	14 (14%)	10 (27%)	20 (32%)	44 (22%)
L-M	24 (24%)	10 (27%)	18 (29%)	52 (26%)
L-H	37 (37%)	10 (27%)	19 (31%)	66 (33%)
Total	100(100%)	37(100%)	62(100%)	199(100%)

DF = 6, $\chi^2 = 13.5399$, $P < .05$.

TABLE 26

Education of Child's Mother (Variable 146, prenatal interview)

K-means groups:	Grade Completed			Total
	0-8	9-11	12+	
H-H	2 (7%)	17 (18%)	19 (24%)	38 (19%)
L-L	10 (37%)	21 (22%)	13 (17%)	44 (22%)
L-M	8 (30%)	31 (33%)	13 (17%)	52 (26%)
L-H	7 (26%)	26 (27%)	33 (42%)	66 (33%)
Total	27(100%)	95(100%)	78(100%)	200(100%)

Df = 6, $X^2 = 14.66$, $P < .05$.

TABLE 27

Education of Child's Mother, excluding H-H group (variable 146, prenatal interview)

K-means groups:	Grade Completed			Total
	0-8	9-11	12+	
L-L	10 (40%)	21 (27%)	13 (22%)	44 (27%)
L-M	8 (32%)	31 (40%)	13 (22%)	52 (32%)
L-H	7 (28%)	26 (33%)	33 (56%)	66 (41%)
Total	25(100%)	78(100%)	59(100%)	162(100%)

Df = 4, $X^2 = 10.76$, $P < .05$.

TABLE 28

Mother's Evaluation of Child's Performance at Age 5: Alphabet, Counting, Printing (Variables 238, 240, 241, Family Interview)

K-means groups	Number of "very well" responses				
	0	1	2	3	Total
H-H	1(5%)	3(9%)	16(25%)	18(25%)	38(20%)
L-L	11(50%)	9(28%)	11(17%)	9(13%)	40(21%)
L-M	4(18%)	10(31%)	16(25%)	19(26%)	49(26%)
L-H	6(27%)	10(31%)	20(32%)	26(36%)	62(33%)
Total	22(100%)	32(100%)	63(100%)	72(100%)	189(100%)

Df = 9, $\chi^2 = 10.0166$, $P < .02$.

TABLE 29

Style of Teaching Reported by Mothers (Variable 244, Family Interview)

K-means groups	Style of Teaching*		
	Casual	Planned	Total
H-H	17 (16%)	20 (26%)	37 (21%)
L-L	24 (23%)	13 (17%)	37 (21%)
L-M	34 (33%)	13 (17%)	47 (26%)
L-H	29 (28%)	30 (39%)	59 (33%)
Total	104 (100%)	76 (100%)	180 (100%)

Df = 3, $\chi^2 = 8.77$, $P < .05$.

TABLE 30

Style of Teaching Reported by Mothers, Excluding H-H Group (Variable 244, Family Interview)

K-means groups	Style of Teaching*		
	Casual	Planned	Total
L-L	24 (28%)	13 (23%)	37 (26%)
L-M	34 (39%)	13 (23%)	47 (33%)
L-H	29 (33%)	30 (54%)	59 (41%)
Total	87 (100%)	56 (100%)	143 (100%)

Df = 3, $\chi^2 = 6.24$, $P < .05$.

*Styles of teaching skills to children were classed as "casual" when the mother could not describe what she had done, when she reported off-hand instruction, or when she reported encouraging imitation or repetition on the part of the child. "Planned" styles included the use of teaching aids (such as flash cards, blocks, pictures, etc.) or a display of some ingenuity in helping a child master a problem (such as breaking a task down into smaller units, or providing a simple model on which to practice).

TABLE 31

Older Sibling with Reading Problems (Variable 268, Family Interview)

K-means groups	Report of older sibling with reading problems		
	Yes	No	Total
H-H	13 (14%)	12 (23%)	25 (17%)
L-L	25 (27%)	9 (17%)	34 (24%)
L-M	29 (32%)	10 (19%)	39 (27%)
L-H	24 (26%)	21 (40%)	45 (31%)
Total	91 (100%)	52 (100%)	143 (100%)

Df = 3, $\chi^2 = 16.2936$, $P < .001$

TABLE 32

Mother's Education Aspirations for Children (Variable 273,
Family Interview)

K-means group	Amount of Education Desired			
	High School	Some College	College Grad	Total
H-H	4 (7%)	12 (29%)	18 (23%)	34 (19%)
L-L	14 (26%)	9 (22%)	12 (15%)	35 (20%)
L-M	13 (24%)	6 (15%)	27 (34%)	46 (26%)
L-H	23 (43%)	14 (34%)	23 (29%)	60 (34%)
Total	54 (100%)	41 (100%)	80 (100%)	175 (100%)

Df = 6, $\chi^2 = 14.1896$, $P < .05$.

The following is a list of variables which were tested for association with the four performance groups of children. Significance levels of χ^2 are given when these were $\leq .05$. In many cases, inspection of the data made it clear that any possible association was with the H-H group; in these instances no further testing was done.

Those items marked with an asterisk were tested without the H-H group, that is, for association with the three groups which read poorly in the first grade (L-L, L-M, L-H); except in the two cases noted above, no significant associations were found.

Prenatal interview

Variable No. 135 Family income

136* Number of persons supported

137* Number of children under 8 years
old ($P < .05$)

138 Regularity of income

139 Source of income (earned, not earned)

140 Socioeconomic score

146* Mother's education ($P < .05$; without
H-H $P < .05$)

151 Number of mother's prior marriages

153* Size of mother's birthplace (urban
or not)

158* Father in household

159* Father's education

Family interview, Child age 5 years

Variable No. 217 Response to "Children should be
seen and not heard."

236 Reading as a masculine or feminine
activity

238* Mother's rating of child's performance:
Alphabet

240* Counting

241* Printing

238, 240, 241* Combined responses ($P < .02$)

244* Mother's style of teaching
($P < .05$; without H-H $P < .05$)

245 Person who provides primary care of
child

246 Number of hours child watches T.V.
per day

250 Child's preferred activities

252 Presence of newspapers in home

253 Presence of magazines in home

257 Mother's enjoyment of reading

258 Father's enjoyment of reading

260 Child read to at age 2 1/2

- 262 Frequency with which child read to
(age 2 1/2)
- 263 Child likes being read to (age 5)
- 264 Frequency with which child is read to
(age 5)
- 266* Mother had reading problem as child
- 267* Father had reading problem as child
- 266,267* Either parent had reading problem
- 268* Older sibling had/has reading problem
($P < .001$)
- 270 Mother's explanation of older child's
school problem
- 272 Mother's explanation of an older
child's school success
- 273* Mother's education aspirations for
children ($P < .05$)
- 274 Different educational goals for boys
and girls

Socioeconomic interview, child age 7 years

- Variable No. 176 Number of households in which child
has lived
- 178 Number of persons supported by family
income
- 179 Number of children under 8 years old

- 180 Regularity of income
- 181 Source of income (earned, not earned)
- 182 Socioeconomic score
- 187 Number of changes in family residence
since child's birth
- 196 Number of mother's marriages since
child's birth
- 197 Mother's employment status (working
or not)
- 200 Father in household

SUMMARY

1. Reading Study families were drawn from a population defined as medically indigent for the purpose of admission to a public clinic. They displayed a range of socioeconomic scores (which consider occupation and education as well as financial circumstances). Mean scores, however, were low: it was a population of poor people, and, as might be expected, Blacks were poorer than Whites, they occupied lower ranking occupations, and they had somewhat less education. Moreover, during the period of the study, Whites were able to improve their socioeconomic status somewhat more than were Blacks. Young families, particularly those with male household heads (considerably more frequent among Whites) made the greatest socioeconomic gains.

2. Associations between socioeconomic and performance variables can only be suggestive, since systematic analyses could not be completed. Changes in the sex of the household head from female to male between the prenatal and 7-year interviews showed a significant association with higher reading scores in White girls in the first three grades. For Black girls, the same change showed significant relationships with the results of second and fourth grade tests. The only significant association between a shift in the sex of household head and the performance of boys was for fifth grade Black boys: lower performance scores were associated with

a shift from male to female household head. All groups of boys showed lower average performance scores than did girls, the difference tending to increase with grade level.

3. The amount of change in socioeconomic score over the seven-year period between interviews showed no significant association with articulation of initial consonant on the three-year speech examination (which, on other evidence, held some promise of predicting subsequent reading performance).

When SAT scores were compared with amount of change in socioeconomic scores, the means for children in families whose scores rose more than 21 points were higher in almost all groups of children (race/sex/grade), but only a few of the differences were significant at the .05 level.

4. The results of multiple regression analyses using 15 socioeconomic variables (cf. Meyerowitz 1967) were inconclusive. Those variables which seem to be most promising were mother's education, mother's own history of reading problems, mother's attitude toward reading, and family socioeconomic index score; these items seemed more likely to be related to girls' performance than to boys'. Significant associations between a child's reading performance and his mother's educational level also occurred in many of the race/sex/grade groups.

5. The analysis of groups of children segregated in terms of similarity of performance on first and sixth grade tests

(rather than by race/sex/grade) also suggests the importance of mother's education. In addition, her description of herself as a teacher of both intellectual and non-intellectual skills emerged as of some significance. This might be referred to as competence, a more restricted usage but one consistent with that of White (1959; cf. also M. Brewster Smith, 1974).

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EPILOGUE

The children comprising this cohort were possessed of a mean I.Q. only a few points below the accepted national norm of 100. If one accepts, as do many school systems, the notion that I.Q. is the sole determinant of scholastic achievement, the cohort should have performed less well than the individuals used to develop national norms for various standardized tests of prediction and achievement. They should have performed, as a group, approximately five percent less well. The Whites should have performed only about two percent less well, the Blacks about ten percent less well. Thus, other factors must be sought in attempting to determine the cause(s) for the poor performance by this group.

We have looked at socioeconomic and familial characteristics of these children. There is, at best, a partial explanation for the poor performance of this group.

The other major areas which exert a major influence on scholastic performance are the child and the teacher. The child's attitude, industry, ambition and perseverance all influence his performance. These qualities were not and could not be measured by this study.

Also missing from this study is the influence, positive or negative, of the teacher.

Warburton and Southgate indicate the importance of the influence of the teacher, in non-quantitative terms. They,

and Helle, indicate that the teacher's influence is likely to be more influential with, and is less likely to be challenged by, parents of lower income than those with higher income.

We did not attempt determination of the influence of the teacher nor those features of the child which determine personality, attitude, learning style and other subjective qualities which might influence scholastic achievement.

We did look quite extensively at the biological (medical) aspects of the cohort, at the neuropsychological and the socioeconomic. Combining all of these elements permits delineation of the poorly performing and the relatively good performers, in the pre-school period. An intermediate group is identified, comprised of subgroups which begin relatively poorly and then show acceleration of achievement at different times. Reading achievement scores at the end of the first and second grade confirm this classification.

These comments are not necessarily applicable to cohorts other than the one reported herein. The observations described in this report provide little insight into mechanisms or processes related to scholastic achievement, or developmental issues. The predictive (analytic) power of the pre-school parameters is too weak to be of value in this regard.

An explanation for the poor achievement of this group, and more accurate prediction of outcome will almost certainly require assessment of personality of student and influence

of and interaction with teachers. A more circumscribed assessment in the pre-school period, more attention to cognitive style and influence of teacher, and more personalized, more effective long-term evaluation of a lesser number of subjects would be required to obtain these ends.

Appendix I

THE COLLABORATIVE STUDY

The material presented in Appendix I is, in part, quoted, abstracted or modified from: The Collaborative Study on Cerebral Palsy, Mental Retardation, and Other Neurological and Sensory Disorders of Infancy and Childhood, Part I, A Synopsis, March 1966, prepared by the U. S. Department of Health, Education, and Welfare; Public Health Service; National Institutes of Health: Bethesda, Maryland, 20014; National Institute of Neurological Diseases and Blindness, Perinatal Research Branch.

A. HISTORY OF DEVELOPMENT, PURPOSE,
AND GENERAL INFORMATION

Shortly after the establishment of NINDB in Fiscal Year 1951, an increasing number of studies indicated that many neurological deficits seemed to be associated with perinatal, natal and postnatal damage to the nervous system.

The causes of the most common of these deficits - cerebral palsy, epilepsy, mental retardation, deafness and blindness - were largely unknown at that time. There was strong belief that the origin of these conditions lay in factors that come into prominence or in events that occur during the time period between conception and the early months of life. One effort directed toward studying this presumed causal relationship was The Collaborative Project for the Study of Cerebral Palsy, Mental Retardation and Other Neurological and Sensory Disorders of Infancy and Childhood. The objective of this study is the determination of the relationships between factors affecting women during pregnancy and the neurological and sensory disorders of their offspring.

The central operational feature of the Study is the development of a considerable body of information on a large cohort of gravidae and the products of their pregnancies and the processing of this massive amount of information so that any segment can be retrieved rapidly.

Planning of the Study began in 1957. Enrollment of pregnant women onto the Study began in January 1959; enrollment terminated on January 1, 1966.

The Collaborative Project is a prospective study involving the collaboration of 14 separate medical centers in the United States. The Project is conducted according to a single study design and the data are collected and recorded in a uniform fashion. A unique feature of this Study is that the data recorded at any given time are not based by reference to antecedent events and remain unchanged in the light of subsequent developments. Data are recorded at the earliest possible time after an event pertinent to the aims of the Study has taken place. Records of these events, in the form of standardized examination or observation protocols, are submitted to the Perinatal Research Branch (PRB) of NINDB for coding and processing. The Study design called for the systematic collection of data through the perspective² observation and examination of a maximum of 60,000 pregnancies (actual number observed is 55,232) and periodic observation by members of various disciplines through the eighth birthday, plus or minus three months.

Most of the data collection forms used by the Study are structured and precoded. Information is collected and recorded by specially trained and highly skilled interviewers and examiners. All positive findings and/or responses to a question are described more extensively in a special section

of each form set aside for this purpose. Standardized manuals are available for every form with instructions for completing them and with definitions of specific items of information, such as diseases, as necessary.

Workshops and training sessions have been conducted for interviewers, observers, and examiners of many disciplines responsible for completion of various parts of the Study protocol. These instructional programs provide specific instructions in interviewing procedures, examination techniques, and other relevant facets to insure adequacy, uniformity, comparability and reliability in data collection. These sessions have also been used for developing and testing special protocols required at odd times.

The data base resulting from these efforts will provide information, stratified according to many demographic characteristics, on the course of pregnancy and the course of development in infancy and early childhood.

The Collaborative Project investigators will make use of this file to investigate the relationships among factors and conditions affecting parents and the occurrence and course of abnormalities in their offspring. The investigation is directed toward: 1) examination in depth of the effect of factors already suspect; 2) the identification of factors not presently suspect; 3) the elucidation of mechanisms by which these factors operate.

Prenatal factors and conditions to be investigated include: 1) the conditions of pregnancy itself, such as

infection, trauma, drug reactions, or the progress of labor; and the normal and abnormal physiology of pregnancy, labor and delivery; 2) the environmental factors - social and economic conditions, emotional stress, or medical care - influencing parents; 3) the biological factors - age, medical and reproductive history, immunologic characteristics - in parents; 4) the genetic background of the parents.

Other objectives of the study are: 1) the evaluation of the relation of prenatal factors to early and late fetal loss, prematurity, infant and early childhood mortality, and other aspects of the reproductive process and its outcome; 2) the dynamics of physical and mental development in early childhood, and the relationship of this development to genetic, biological and environmental factors; 3) the evaluation of the significance of events in the postnatal environment in relation to the later development of disturbances of structure and function of the nervous system and other systems; 4) precise definition of the events of the reproductive process and the nature of its outcome.

B. SCHEDULE OF DATA COLLECTION

I. PRENATAL PHASE

This phase of data collection generally reflects accepted obstetrical practice. One difference from ordinary practice is that the subject is evaluated more frequently, the amount of information collected is greater than usual, collection and recording of data is according to a predetermined protocol, and the collection and analogy of biological specimens is more elaborate than in customary practice. A second difference is the development and administration of a socio-economic questionnaire by an anthropologist and the acquisition of an extensive genetic history of the gravida's family.

II. NATAL PHASE

The gravida is admitted to the hospital for delivery. She is under surveillance by a trained observer during labor and delivery. Data on blood pressure, fetal heart rate, the frequency and spacing of uterine contractions, and any other intercurrent events, such as bleeding or meconium staining of amniotic fluid. The observer also records information on the progress of labor as it is narrated by the obstetrician in charge. Any other remarkable events occurring during labor and delivery are documented by the observer. Observers are usually nurses (true at UOMS) who have been trained specifically for this role.

III. POSTNATAL PHASE

1. Immediate neonatal period.

A person specially trained for this purpose, usually the observer (two observers, one each for mother and child, were employed whenever feasible at UOMS) obtains interval Apgar ratings, time of onset and nature of respirations, and type and duration of resuscitation.

2. Later neonatal period.

- a. At birth: examination by pediatricián
- b. Daily, until discharged from hospital or one week of age: examination by pediatrician
- c. At 48 hours of age: examination by neurologist
- d. As necessary: recording, by nurses, of significant intercurrent events.

3. Fourth months of age.

- a. Examination by pediatrician
- b. Interval medical history

4. Eight months of age.

- a. Examination by psychologist, utilizing a Nancy Bayley scale
- b. Interval medical history

5. One year of age.

- a. Neurological examination
- b. Interval medical history

6. Two years of age.

- a. Home visit by specially trained Public Health Nurse
- b. Interval medical history

7. Three years of age.
 - a. Examination of speech, language and hearing status by speech pathologist and audiologist
 - b. Interval medical history
8. Four years of age.
 - a. Detailed examination by a psychologist, including administration of a Stanford-Binet Intelligence Scale, assessment of fine motor development and gross motor development, a test of the child's concept formation skills, and a behavioral profile, relating to the qualitative aspect of the child's behavior during the examination.
 - b. Interval medical history
9. Five years of age.
 - a. Interval medical history, usually by home visit (almost always at UOMS)
10. Six years of age.
 - a. Repeat of "9"
11. Seven years of age.
 - a. Neurological examination
 - b. Detailed psychological examination, including administration of the WISC, Bender Visual Motor Gestalt Test, evaluation of creative abilities and fine motor function. The level of academic achievement is evaluated by administration of the Wide Range Achievement Test.
 - c. The genetic and socio-economic information collected prenatally is up-dated.
 - d. Interval medical history
12. Eight years of age.
 - a. Reassessment of speech, language and hearing status.
 - b. Administration of Gray's Oral Reading Test
 - c. Interval medical history

Appendix II
Principal Personnel

The curricula vita of the principal personnel executing this study are contained herein. Their specific relationship to the study is as follows:

John B. Isom - project director.

Judith G.L. Brown - Research Associate and Administrative Assistant, 1966-1969, responsible for all pre-school testing, 1966-1970.

Quentin D. Clarkson - Consultant for statistics.

Kathrine S. French - Consultant in Anthropology, responsible for construction and administration of Reading Study Family Interview (FILE) and of Part II of this report.

CURRICULUM VITA

JOHN B. ISOM, M.D.

Birthdate: June 16, 1925
Place of Birth: Nashville, Tennessee
Nationality: U.S. Citizen
Title: Professor of Pediatrics
Associate Professor of Neurology
University of Oregon Health Sciences Center
Education: Vanderbilt University, B.A., 1950
Vanderbilt University School of Medicine,
M.D., 1954

Professional Experience:

Intern, Vanderbilt University Hospital, 1954-55.
Resident in Pediatrics, State University of Iowa
Hospitals, Iowa City, 1955-56.
Resident in Pediatrics, St. Louis Children's Hospital,
St. Louis, Mo., 1956-57.
Medical Practice, Pediatrics, Mease Diagnostic and
Treatment Center, Dunedin, Florida, 1957-58.
Instructor, Department of Pediatrics, Vanderbilt
University Hospital, 1958-59.
USPHS Special Fellow In Neurology, Vanderbilt University
Hospital, 1958-59.
USPHS Special Fellow in Pediatric Neurology, Mass.
General Hospital, Boston, 1960-61.
USPHS Special Fellow in Neuropathology, Mass. General
Hospital, Boston, 1961-62.
USPHS Special Fellow in Neurophysiology, Clinical
Fellow in Neurosurgery, Mass. General Hospital,
Research Fellow in Biochemistry, Harvard Medical
School, 1962-63.
Associate Professor of Pediatrics, University of Oregon
Medical School, 1963--.
Associate Professor of Neurology, University of Oregon
Medical School, 1963-1975
Professor of Pediatrics, University of Oregon Medical
School, 1970--.

Memberships:

American Academy of Neurology
North Pacific Pediatric Society

Memberships: (cont.)

Oregon Society of Critical Care Medicine
Western Society for Pediatric Research
Portland Academy of Pediatrics
Oregon Neuro-Psychiatric Society
Western Federation of Neurological Sciences

Diplomate - American Board of Pediatrics

Member - Neurological Disorders Program Project Series
Committee, 1968-72.

Member - Neurology Circuit Course Program, Oregon Regional
Medical Program, 1969-71.

PRESENTATIONS

Convulsive Disorders in Children. Central Oregon Medical Society, Bend, Oregon, May 4, 1964.

On Childhood Seizures. Portland Academy of Pediatrics, Portland, Oregon, June 8, 1965.

What is Perception? Developmental Aspects with Emphasis on Vision and Kinesthesia. Symposium--The Child with Central Nervous System Deficit: Physical Therapy Aspects, Stanford University School of Medicine, Palo Alto, California, September 13, 1965.

The Natural History of Dyslexia. Reed College Community Education Project, Reed College, Portland, Oregon, July 30, 1966.

Research in Early Identification of Learning Disorders. Oregon Council for Exceptional Children - Fall Conference, Salem, Oregon, October 14, 1966.

Developmental Dyslexia. Western Society for Pediatric Research, Palo Alto, California, November 7, 1966.

Neurological Evaluation of the Child with School Problems. Symposium - Education of the Neurologically Handicapped Child. University of Oregon, Eugene, Oregon, February 11, 1967.

Onset of Cogan's Syndrome at 34 months of Age. American Academy of Neurology, 19th Annual Meeting, San Francisco, California, April 28, 1967.

Neurological Research Relevant to Reading. Interdisciplinary Session - International Reading Association, Annual Convention, Seattle, Washington, May 4, 1967.

On Sequencing, Laterality and Dominance in Reading Problems. Reading Workshop, Riverside Unified School District, Riverside, California, June 26, 1967.

On Reading Disability. American Academy of Pediatrics Post-graduate Course No. 1 - School Problems. University of Oregon Medical School, Portland, Oregon, August 26, 1967.

Some Neuropsychological Findings in Children with Reading Problems. Annual Claremont Reading Conference, Claremont College, Claremont, California, February 9-10, 1968.

Dyslexia. Yamhill County Medical Society, McMinnville, Oregon, March 5, 1968.

Visual Testing and Perception. Oregon Nurses Association Annual Meeting, Portland, Oregon, March 12, 1968.

Children Who Do Not Read Well. North Pacific Pediatric Society, Annual Scientific Program, Portland, Oregon, March 7, 1968.

Selected Neuropsychological Observations on Children Who Do Not Read Well. Oregon Academy of Ophthalmology and Otolaryngology, 27th Annual Convention, Portland, Oregon, April 6, 1968.

Re Dyslexia. Annual Bilderback Lectureship Program, University of Oregon Medical School, Portland, Oregon, April 16, 1968.

An Interpretation of Dyslexia. Thirteenth Annual Convention of the International Reading Association, Boston, Mass., April 25, 1968.

Evolution of a Dyslexic. Northern Montana College, Havre, Montana, July 25, 1968.

Neurological and Psychological Evolution of 250 Teacher-referred Public School Students with Reading Problems. National Association for the Education of Young Children, Annual Conference, Salt Lake City, Utah, November 14, 1968.

Dyslexia Viewed from the Vantage Point of a Medical Referral Center. Annual In-Service Training Meeting, School District No. 4, Phoenix, Oregon, December 9, 1969.

Focal Seizures: Dystonia and Hysteria - Diagnosis? North Pacific Pediatric Society, Coeur d'Alene, Idaho, September 29, 1969, with Peggy J. Copple and Harold Boverman.

Dyslexia. Maine Pediatric Society, Annual Meeting, Ellsworth, Maine, October 1, 1971.

Drug Therapy of Hyperkinesia. Maine Pediatric Society, Annual Meeting, Ellsworth, Maine, October 2, 1971.

Dyslexia and Minimal Brain Dysfunction. Graduate School Seminar, Portland State University, Portland, Oregon, June 22, 1972.

Head Injury in Children. North Pacific Pediatric Society,
Vancouver, British Columbia, March 9, 1973.

Dyslexia. Graduate School Seminar, Portland State University,
Portland, Oregon, January 10, 1974.

Dyslexia. Presentation to Portland Chapter, Phi Delta Kappa
(Honorary Education Society), Portland, Oregon, January
31, 1974.

Meningitis and Coma. Circuit Course Presentation. Oregon
Medical Association, Eugene, Oregon, April 10, 1974.

Meningitis and Coma. Circuit Course Presentation, Oregon
Medical Association, Bend, Oregon, April 11, 1974.

Treatment of Minor Motor Seizures with MCT-Diet. Child
Neurology Society, Third National Meeting, Madison,
Wisconsin, October 12, 1974.

The Child in the Emergency Room - Neurological Emergencies.
AMA Clinical Convention, Portland, Oregon, December
2, 1974.

PUBLICATIONS

1. Sproffkin, B.E., and Isom, J.B.: Innocent Disturbances in Pupillary Mechanisms. *Am. Practitioner and Digest of Treatment* 11:715, 1960.
2. Sproffkin, B.E. and Isom, J.B.: Sensory Mononeuropathy. *Am. Practitioner and Digest of Treatment* 11:745, 1960.
3. Sproffkin, B.E. and Isom, J.B.: Pressure Palsies of Peripheral Nerve. *Am. Practitioner and Digest of Treatment* 11:829, 1960.
4. Sproffkin, B.E. and Isom, J.B.: Ubicacion de las Mononeuropatias en el Diagnostico Neurologico. *World Neurology* 1:535, 1960.
5. Merrill, R.E., Isom, J.B., Anslow, R. and Pinkerton, J.A.: Hydrocephalus and Meningocele: The Course of 100 Patients. *Pediatrics* 32:809, 1962.
6. Isom, J.B., Kalacyi, M.N. and Drawford, J.D.: Responses of Isolated Toad Bladder to Anisomotic Bathing Media. (Abstract) *J. Clin. Invest.* 41:1367, 1962.
7. Isom, J.B., Gordy, P.D., Selner, J.X., Brown, L.J. and Willis, M.: Brain Abscess due to *Hemophilus Aphrophilus*. *New England Journal of Medicine* 271:1059-1061, 1964.
8. Ames, A., Isom, J.B., and Nesbett, F.: Effects of Osmotic Changes on Water and Electrolyte in Nervous Tissue. *J. Physiol.* 177:246-262, 1965.
9. Isom, J.B.: Perceptual Development--Visual and Kinesthetic--A Brief Review. *J. Amer. Phys. Ther. Assoc.* 46:734-740, 1966.
10. Copple, P.J. and Isom, J.B.: Classification and Treatment of Seizure Disorders in Children. *Journal Lancet*, 1967.
11. Isom, J.B.: Neurological Research Relevant to Reading, in *Perception and Reading*, p. 67-71, Helen K. Smith, ed., International Reading Association, Neward, Delaware, 1968.
12. Isom, J.B.: Some Neuropsychological Findings in Children with Reading Problems. *Claremont Reading Conference*, 32nd Yearbook, pp. 188-198, Malcolm P. Douglass, ed., Claremont University Center, Claremont, California, 1968.

13. Isom, J.B.: An interpretation of Dyslexia - a Medical Viewpoint, in Reading Disability and Perception, George D. Spache, ed., pp. 1-7, International Reading Association, Neward, Delaware, 1969.
14. Isom, J.B.: Reading Disabilities, in Textbook of Pediatrics, 9th edition, Waldo E. Nelson, Victor C. Vaughn, III, and R. James McKay, ed., W.B. Saunders Co., Phila., 1969.
15. Isom, J.B.: Trauma to the Head, in Current Pediatric Therapy 4, pp. 76-78, Sydney S. Gellis and Benjamin M. Kagan, ed., W.B. Saunders Co., Phila., 1970.
16. Isom, J.B.: Some Neuropsychological Findings in Children with Reading Problems, in Reading in Education, edited by Malcolm P. Douglass, Chas. E. Merrill Publishing Co., Columbus, Ohio, 1973.
17. Isom, J.G.: Reading Disabilities, in Textbook of Pediatrics, 10th edition, pp. 123-126, Victor C. Vaughn, III, editor, W.B. Saunders Co., Phila., 1975.
18. Some Neuropsychological Findings in Children with Reading Problems, in Remedial Reading, Classroom and Clinic, pp. 118-129, edited by Leo M. Schell and Paul C. Burns, Allyn and Bacon, Inc., Boston, 1972.

Curriculum Vita

Judith G.L. Brown

Birthdate: May 22, 1917
Place of Birth: Los Angeles, California
Nationality: U.S. Citizen
Title: Research Associate
University of Oregon Medical School
Education: University of California at Los Angeles,
B.A., 1940
University of Oregon, M.A., 1956

Professional Experience:

Special Education Instructor and Bedside Instructor,
Los Angeles Public Schools and Los Angeles County
Hospital, 1940-52.

Remedial Reading Clinician, Portland Public Schools,
Portland, Oregon 1952-56.

Braille Resource Teacher, Portland Public Schools,
1956-58.

Remedial Reading Clinician, Portland Public Schools,
1958-66.

Instructor in Diagnostic and Remedial Techniques and
Supervisor, Remedial Reading Clinic, Division of
Continuing Education, Oregon State System of Higher
Education, 1961-64.

Consultant, Educational Development Laboratories,
1963-65.

Instructor in Initial Teaching Alphabet, Portland
Public Schools and Division of Continuing Education,
1965.

Memberships:

President of Oregon Chapter, Council for Exceptional
Children, 1958.

Curriculum Vita
Judith G.L. Brown
Page Two

Memberships (cont.):

President of Oregon Council of the International
Reading Association, 1961.

Publications:

A Rationale for Teaching the Disadvantaged. Proceedings
of the Seventh Annual Convention of the International
Reading Association, Philadelphia, Pennsylvania.

Using i.t.a. with Minimally Neurologically Involved
Dyslexic Children. Proceedings of the Second
International Conference of the Initial Teaching
Alphabet. Bethlehem, Pennsylvania, August, 1966.

CURRICULUM VITA

Name: Quentin D. Clarkson
Date of Birth: September 26, 1925
Place of Birth: Eugene, Oregon
Address: Portland State University
P.O. Box 751
Portland, Oregon 97207
5203 S.E. 38th
Portland, Oregon 97202 (home)

EDUCATIONAL BACKGROUND

North Carolina State University, Raleigh, North Carolina	Postdoctoral Study (Statistics)	1965-67
Oregon State University Corvallis, Oregon	Postdoctoral Study (Statistics)	1962-63
Oregon State University Corvallis, Oregon	Ph.D. (Botany)	1955
University of Oregon Eugene, Oregon	M.S. (Biology)	1950
University of Oregon Eugene, Oregon	B.S.	1949

PRESENT STATUS

Associate Professor, Portland State University and:
Consultant in Statistics, Beaverton Public Schools 1970 -
Consultant in Statistics, University of Oregon
Health Sciences Center 1968 -
Consultant in Statistics, Child Study Clinic,
University of Oregon Dental School 1967 -

VITA (cont.)
Quentin D. Clarkson

PROFESSIONAL EXPERIENCE

Visiting Professor (Statistics)
Oregon State University

Summer 1968

Associate Professor (Biology)
Portland State University
(except for leave for postdoctoral study)

1955-68

COURSES TAUGHT

General Statistical Methods
Sampling Methods
Regression Analysis
Experimental Design
Applied Multivariate Methods
Fortran Programming (Workshops)

MAIN INTERESTS

Applied multivariate analysis, cluster analysis, statistics of program evaluation, analysis of large data sets.

HONORS

Sigma Xi
Phi Kappa Phi

PROFESSIONAL SOCIETIES

American Statistical Association
Biometric Society

SELECTED PUBLICATIONS

Sanin, C., Savara, B.A., Clarkson, Q.D., and Thomas, D.R., 1970
Prediction of occlusion by measurements of the deciduous
dentition. American Journal of Orthodontics, 57 (6): 561-72.

Henderson, B.B., Goffeney, B., Butler, B.B., and Clarkson, Q.D.,
1971. Differential rates of school promotion from first
grade for white and Negro, male and female 7-year-olds.
Psychology in the Schools, 8 (2): 101-9.

VITA (cont.)
Quentin D. Clarkson

SELECTED PUBLICATIONS (cont)

Henderson, N.B., Butler, B.B., Goffeney, B., Saito, C.H., and Clarkson, Q.D., 1971. Sex of person drawn by Japanese, Navaho, American white, and Negro 7-year-olds. *Journal of Personality Assessment*, 35 (3): 261-4.

Arya, B.S., Savara, B.S., Clarkson, Q.D., and Thomas, D.R., 1973. Genetic variability of craniofacial dimensions. *Angle Orthodont.*, 43 (2): 207-15.

Clarkson, Quentin D., Neuberger, W.F., Koroloff, N. Submitted, April 1975. Some Statistical Aspects of Program Evaluation.

CURRICULUM VITA

Name: Kathrine S. French

Born: Champaign, Illinois, June 5, 1922.

Education:

1942 B.A., summa cum laude, Pomona College, Claremont, California.

1955 Ph.D., Columbia University, New York, N.Y.
(Anthropology)

Employment:

1943-46 Social Worker, Japanese-American Relocation Center (War Relocation Authority), Poston, Arizona.

1949-51 Assistant Administrator, Fair Employment Practices Commission, Oregon State Bureau of Labor, Salem, Oregon.

1951-54, 1955-57 Instructor in Anthropology, Portland Extension Center, Oregon State System of Higher Education, Portland, Oregon.

1959-- Research Associate (1959-60), Instructor (1960-64), Assistant Professor (1964-73), Associate Professor of Anthropology in Pediatrics (1973-), University of Oregon Health Sciences Center, Portland, Oregon.

Memberships in Professional Organizations:

American Anthropological Association, Fellow.

American Ethnological Society (Treasurer, 1959-61).

Society for Applied Anthropology, Fellow.

American Sociological Association, Associate (Section on Medical Sociology)

Group for Medical Anthropology (Chairman, Committee on Anthropology and Pediatrics, 1969-75).

Field Work and Research:

- 1943-46 Japanese-Americans, Poston, Arizona. (Community study).
- 1950-58 American Indians, Warm Springs Reservation, Oregon. (General ethnography).
- 1960, 1966, 1968 The Auvergne, France. (Ethnomedicine).
- 1959-71 Socioeconomic and cultural characteristics of the Collaborative Study population.
- 1970-- Relationships between socioeconomic environments, parental behaviors, and reading performance of children.

Publications:

- 1955 The Warm Springs Indian Community. The American Indian 7:2:3-17 (with David H. French).
- 1962 Research Interviewers in a Medical Setting: Roles and Social Systems. Human Organization 21:3: 219-224.
- 1963 Ceremonial Segmentation. In Actes de VI^e Congres International des Sciences Anthropologiques et Ethnologiques, Paris, 30 juillet-6 aout, 1960. Tome II, Ethnologie (premier volume), pp 101-104.
- 1964 Review of: Social Research to Test Ideas: Selected Writings of Samuel A. Stouffer. Introduction by Paul F. Lazarsfeld. American Anthropologist 66: 4:965-966 (with David H. French).
- Review of: The Hospital in Modern Society. Edited by Eliot Freidson. American Anthropologist 67: 1:193-194.
- 1968 An application of the U.S. Bureau of the Census Socioeconomic Index to a large, diversified patient population. Social Science and Medicine 2:3: 283-299 (with N.C. Myrianthopoulous).